THE FOOD INDUSTRIES JOURNAL

VOL. I NOVEMBER 1967 No. 7

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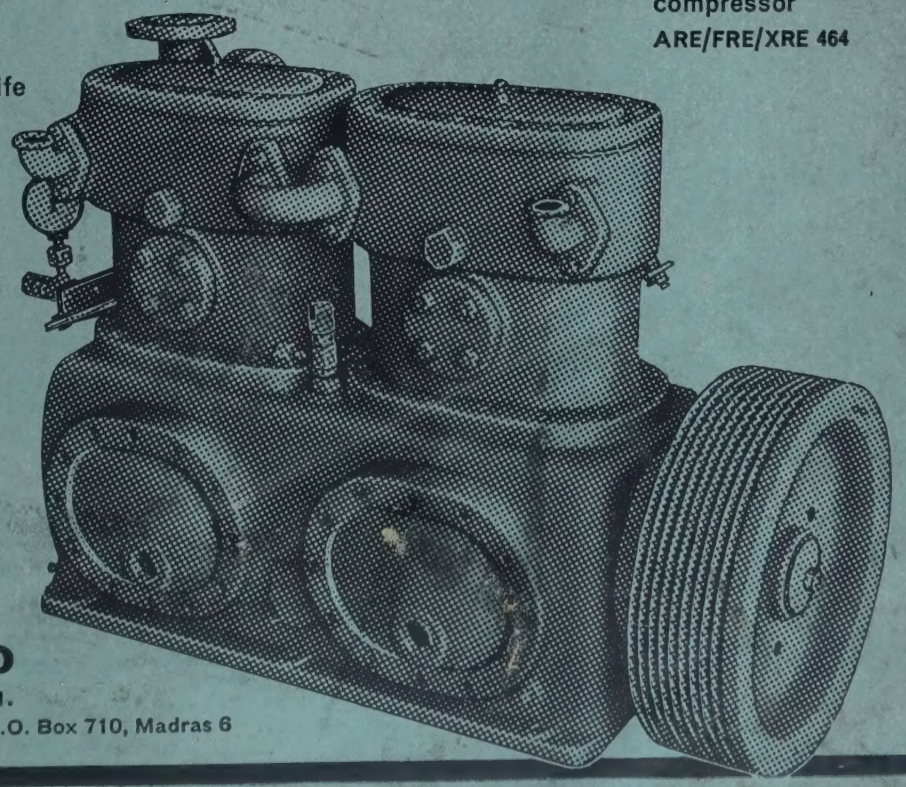

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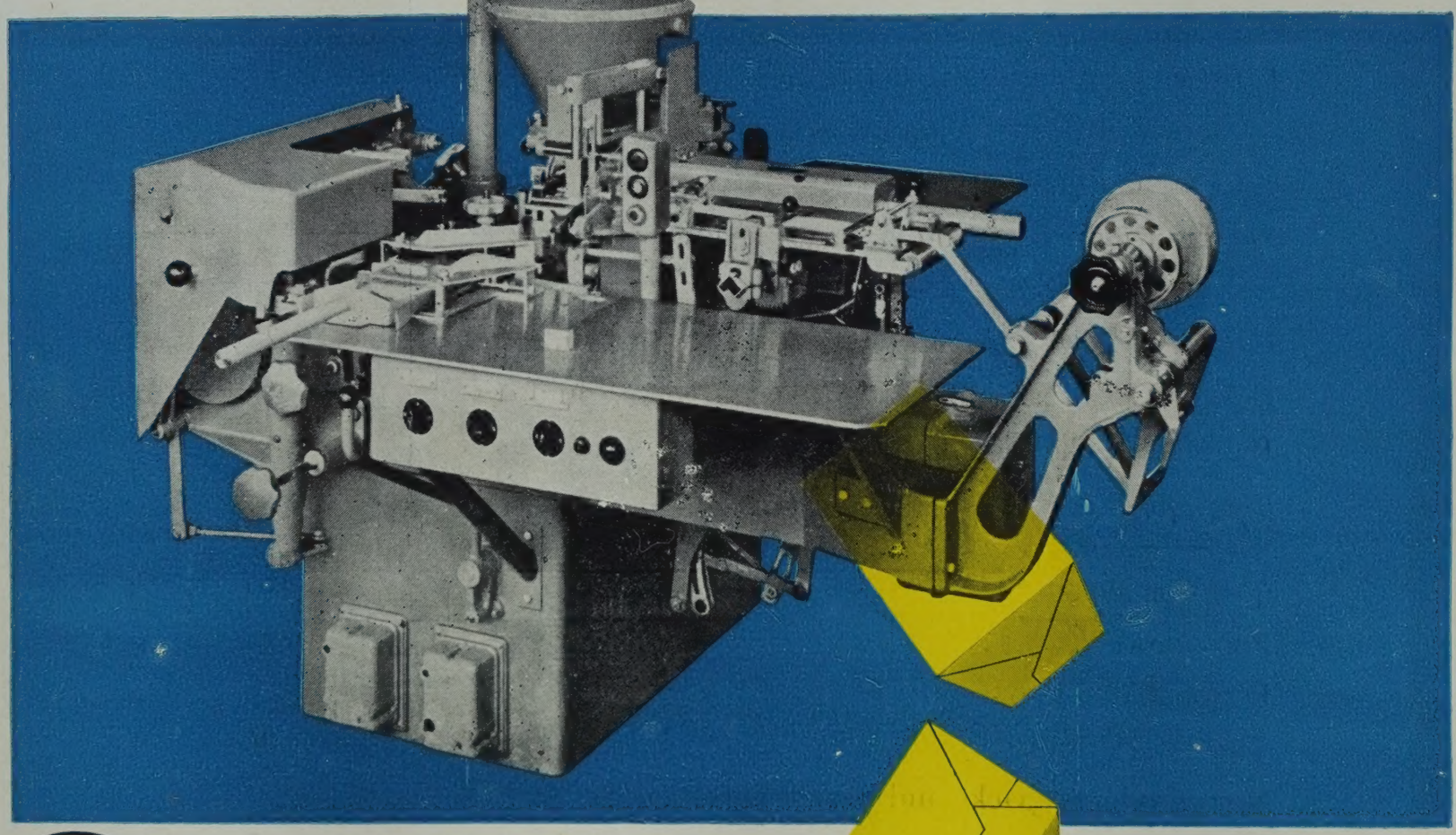

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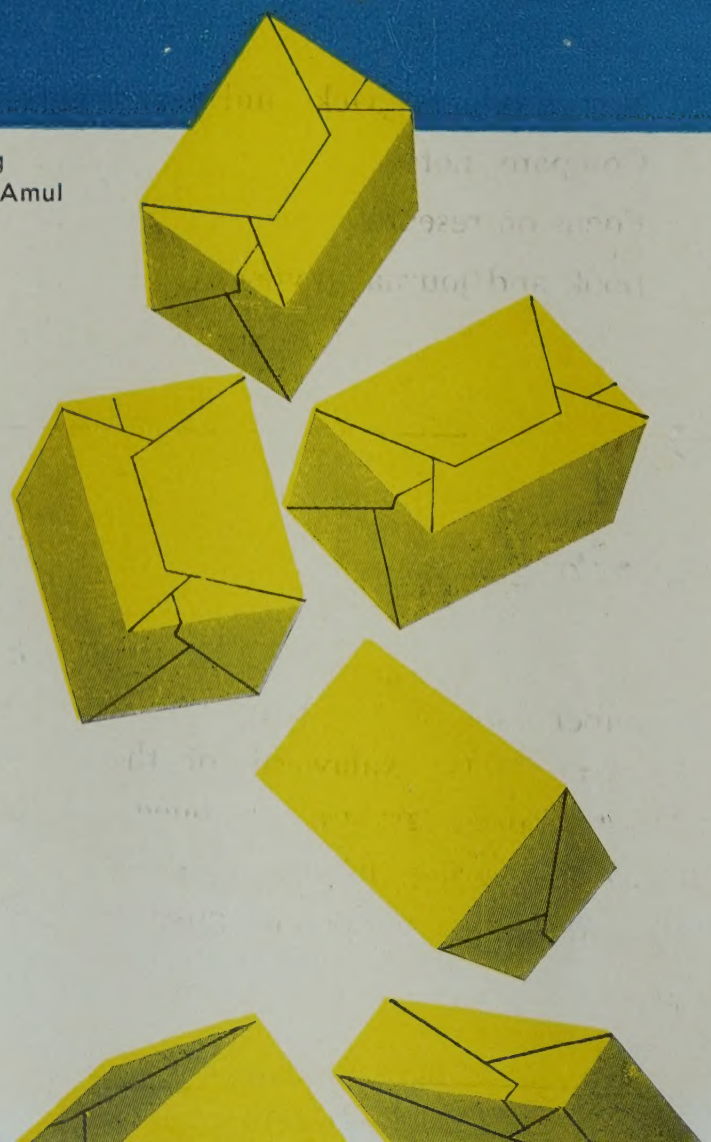

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Next Month....

In the December issue of The Food Industries Journal, Mr. U. G. Nalawadi, of the Division of Horticulture, Agricultural College, Dharwar, in an interesting article based on research, will discuss the commercial possibilities of manufacturing jams and jellies from *Carissa Carandas,* a wild fruit known as *karunda* in Hindi. The export potential of the Indian banana will be discussed in another article. The problems, achievements and prospects of the biscuit and confectionery industries will be the theme of a specially commissioned article by Yechanna.

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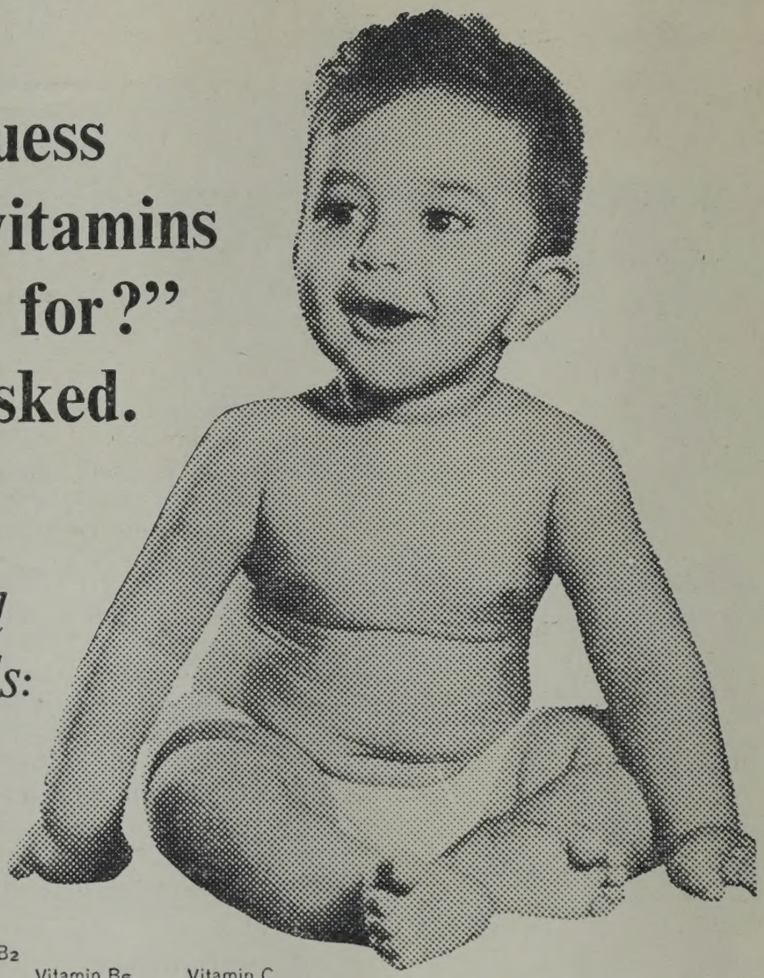

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Editorial

Incentives for export of processed foods

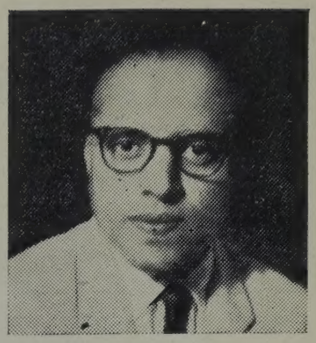
It is just as well that the incentives for exports figured somewhat prominently at the last meeting of the Processed Foods Export Promotion Council. It is true that no firm proposals emerged from the meeting. But the ball has been set rolling. And it must be hoped that New Delhi will soon be able to take a helpful decision.

There is much substance in the plea that the exports of processed foods should be adequately buttressed. First, unlike traditional export items (like tea or jute goods) processed foods demand much larger promotional effort. Secondly, many of the processed food industries are not yet in a position to face competition from their well-established rivals in foreign countries. Thirdly, it will take time for some of these industries to reach a viable economic status and till then, it is essential that the export trade should be kept going; if this involves, as it does, some extra aid the Government should not shrink from giving it.

If Government concedes the need and importance of aid it should not be difficult to work out some practical scheme. The Council's President, Mr. R. Balasubramanian, himself suggested that package programmes up to a limit of Rs. 20 lakhs could be worked out on the basis of sharing of export risks on a 50-50 basis. A scheme on these lines could be worked out. Alternatively, the kind of bonus voucher scheme which Pakistan has used effectively in building up new export markets for its jute goods could be considered. Export promotion is a wide concept and it offers many attractive alternatives. But the main criterion by which any scheme should be chosen is whether the incentives are adequate and also whether it will further the cause of the industry and its exports.

It is of course idle to pretend that all that needs to be done to promote exports is to provide incentives. The fact is that the problem is much more complex. Primarily, it is a question of generating enough export surplus. Already, in some sectors, notably seafoods, there is reason to fear the surplus is not growing as fast as it should. Moreover, there is much that the industry should do to bring down its production costs. And here, New Delhi on its part should lend a helping hand. For instance, there is no reason why it should not readily agree to give sugar at controlled prices to exporting food industries. Given all-round effort and sufficient incentives it should be possible to build up a better export market for processed foods.

PROTEIN HUNGER AND THREAT OF INTELLECTUAL DWARFISM



BY DR. M. S. SWAMINATHAN,

Director, Indian Agricultural Research Institute, New Delhi.

WHILE the concept of balanced nutrition is not a new one, its significance in relation to brain development is a recent discovery. It is now clear that the human brain reaches 80 to 90 per cent. of its full weight by the age of four and that if children do not get adequate protein during this critical period, the brain never develops properly. Comparative studies on the intelligence of different ethnic groups will have to be viewed hereafter from this standpoint also. The widespread protein malnutrition and hunger in India is, therefore, a matter of grave concern, since we may have to witness during the next two decades a growing acuteness of intellectual power in the developed nations on the one hand and intellectual dwarfing in our country, on the other.

RIGIDITY OF FOOD HABITS

While the problem of protein malnutrition is common to all developing nations, its severity is greater in our country owing to the greater rigidity of our food habits. Pulses constitute the most important protein source in the vegetarian diet and today the average consumption of protein is less than 50 gm. against a normal requirement of 80 gm. Unfortunately, while the **per capita** availability of cereals has been calculated to have gone up by 10.6% during 1955-65, there has been a decrease of 16% in the **per capita** consumption of pulses during the same period.

Protein needs will have to be assessed both in terms of quantity and quality. Among the components of protein, about 18 amino acids are necessary for normal growth. Deficiencies of some of them like lysine and methionine are common in a vegetarian diet, while the excess of the amino acid leucine in jowar has been found by the Nutrition Research Laboratory at Hyderabad to be the cause of the disease pellagra in Andhra Pradesh and other areas where jowar is the staple. The content of lysine and methionine in cereals, pulses and milk is given in Table 1.

Table 1

Food	Content in grams per 100 grams of protein	
	Lysine	Methionine
Cereals	1-3	1.5 – 2.5
Pulses	6-8	1.0 – 1.5
Milk	7-8	2.0 – 3.0

Thus, animal products like milk have proteins of better quality. While the increased consumption of animal products is, therefore, desirable, their production is a more expensive process owing to the considerable loss of energy in the conversion of plant products into animal food, as shown in Table 2.

Table 2

Food	Efficiency of conversion (per cent.)	
	Energy	Protein
Milk	40	47
Eggs	20	43
Lamb meat	17	13
Pork	27	19

In the immediate future there may be little scope for diverting large quantities of calories to feed animals in order to get proteins of better quality and hence overcoming protein malnutrition through increased consumption of animal products may not be immediately feasible. In fact, even now the proportion of males to females in cattle appears to be 2 : 1 in several parts of the country, an index of the uneconomic nature of cow-rearing (Table 3).

Table 3

Proportion of cows to bulls and female to male buffaloes

States	Number of cows per 100 cows and bulls/bullocks	Number of female buffaloes per 100 buffaloes
Kerala	62.0	38.0
Rajasthan	54.3	81.7
Jammu and Kashmir	53.5	81.6
Mysore	48.9	76.8
Madhya Pradesh	48.3	66.9
Assam	47.9	50.5
West Bengal	47.1	28.1
Madras	45.9	71.5
Andhra Pradesh	45.6	67.7
Orissa	45.0	38.2
Punjab	43.9	81.8
Bombay	43.4	84.0
Bihar	42.4	65.7
Uttar Pradesh	36.0	78.2

It should, however, be possible to ensure a larger flow of protein food to the feeding of infants and school children through both the mobilisation of public opinion and Government action. The shortage of calories affects the utilisation of proteins, and if the

scientific revolution in the yield potential of cereals and millets is taken to its logical conclusion, the problem of calories can be solved and adults, even vegetarians, can be assured of a satisfactory diet.

OVERCOMING PROTEIN HUNGER

President Johnson's Science Advisory Committee, whose thought-provoking report on "The World Food Problem" has recently been published, has suggested the following steps for increasing and improving protein supplies :

1. Develop high-protein foods, especially for preschool children, from indigenous products.
2. Increase the production and use of pulses and oilseeds such as soybeans, groundnut, and cottonseed.
3. Increase and improve domestic animal production, especially types that do not compete for the food used by human beings.
4. Utilise pond culture of fish, both by itself and in combination with agricultural practices such as rice culture and irrigation projects.
5. Increase catch of sea foods.
6. Expand and intensify research and development related to fish protein concentrate.
7. Develop and utilise new genetic strains of plants that provide protein with a higher nutritional value.

The Committee has also recommended more research on protein from leaves, single-cell microorganisms grown on substrates such as petroleum, and algae. Such research has recently been initiated on a global scale under the International Biological Programme. Intensive research is also needed on the wholesomeness of cereal grains enriched with lysine or other essential amino acids. While all these ideas are important and worthy of vigorous follow-up, we in India have to face this problem **today**, since every year's delay in wiping out the protein hunger in the young could lead to the creation of over 10 million intellectual dwarfs. Much damage must have already occurred in recent years.

MAJOR BREAKTHROUGH

A major breakthrough in the genetic manipulation of protein quality took place in 1964 when Dr. E. T. Mertz, L. S. Bates and O. E. Nelson of the Purdue University, U.S., discovered that a maize variety with opaque seeds had nearly twice the content of lysine as normal maize. When rats were with a diet containing 90% opaque-maize for 28 days, the average daily gain in weight was 97 grams in contrast to 27 grams in those fed in a similar way with normal maize. Pigs grew very well on a diet composed of opaque-maize, minerals and vitamins without any supplementary protein.

These findings showed that the genetic enrichment of cereal proteins with lysine and pulse proteins with methionine as well as the lowering of the leucine content of jowar are all possible. The artificial enrichment of cereal grains with essential amino acids, whose effects are not yet understood in their totality, can thus be avoided. A world collection of wheat and jowar varieties are currently being screened at the Indian Agricultural Research Institute for amino acid composition and interesting differences are already apparent.

Protein quantity varies widely in wheat from 7 to 8 per cent. in some of the varieties commonly cultivated to over 16 per cent. in recently developed strains such as Sharbati Sonora. The application of nitrogenous fertilisers increases protein content by about 50%. Varieties like Lerma Rojo, Sonora 64, Sharbati Sonora and N. P. 852 have shown as high as 18.5% protein when cultivated in fields fertilised with 80 to 120 kg. N per hectare. Similar variations in protein content have also been found in rice, barley, bajra, maize and jowar. Thus, there is enormous scope for increasing the intake of proteins per unit weight of cereals and millets both through the cultivation of high-protein varieties and through the application of fertilisers.

PROTEIN PREMIUM IN PRICING

The introduction of a protein premium in the pricing policy would help to generate protein consciousness among farmers and consumers and at the same time help to increase the protein content of the average Indian diet. Protein assay in samples in grain markets is operationally feasible. A farmer who applies fertiliser invariably raises the protein content in the grain. Sometimes, such grains may develop a little mottling and the present market classification of wheat varieties would penalise rather than reward farmers who have produced grains with a high protein content. Thus, the fixation of wheat price according to protein content will promote an awareness of the importance of both human and plant nutrition.

RESEARCH WORK AT IARI

Besides the quality of proteins, improvement in the content of the essential amino acids can be achieved. Recent work at the Indian Agricultural Research Institute has shown that the wheat variety Sharbati Sonora produced by treating Sonora 64 with atomic radiations has more than double the lysine content found in some of the commonly grown varieties as well as the parent strain, Sonora 64 (Table 4). Quantity and quality can both be combined genetically and the release and spread of high-yielding cum-high-quality varieties of cereals, millets and pulses would offer the least expensive and immediately practicable way of destroying the threat of intellectual dwarfism.

Table 4

Protein and Lysine content of some wheat varieties *

Variety	*Protein (%)*	*Lysine in gm. per 100 gm. crude protein*	*Lysine in gm. per gram of nitrogen*
D. 144	14.4	1.25	0.07
PV. 18	12.1	1.45	0.09
N.P. 891	14.1	1.69	0.10
Lerma Rojo	15.4	1.95	0.11
Sonora 64	14.0	1.86	0.11
C. 306	12.9	2.49	0.14
S. 227	13.0	3.38	0.19
Sharbati Sonora	16.5	4.61	0.26

* Data obtained by Dr. A. Austin of I.A.R.I.

DEVALUATION TELLS ON EXPORTS OF PROCESSED FOODS

INDIA'S exports of processed foods during 1966-67 showed a decline of 22 per cent in terms of dollar value because of the devaluation of the rupee. In terms of rupees, exports during 1966-67 were worth Rs. 446.98 lakhs, compared to Rs. 388.19 lakhs in 1965-66, but in terms of dollars, the value of exports declined from $81.55 lakhs in 1965-66 to $63.5 lakhs in 1966-67.

Addressing the fourth annual general meeting of the Processed Foods Export Promotion Council held in New Delhi on October 18, the Council's Chairman, Mr. R. Balasubramanian, I.A.S., however, noted that but for devaluation, the performance of the food processing sector had on the whole been encouraging.

The following table shows the dramatic effect of devaluation :

Year	*Value of Exports* Rs. in lakhs	$ in lakhs	*Percentage of increase or decrease over the previous year*
1962-63	273.80	57.52	—
1963-64	336.40	70.67	+23%
1964-65	353.46	74.26	+ 5%
1965-66	388.19	81.55	+10%
1966-67	446.98	63.50	—22%

"The hope that devaluation would help in making our products competitively priced in the international markets and would thereby help in increasing our exports has largely been belied. The abolition of the export assistance schemes in the wake of devaluation based on this hope and the uncertain period that followed thereafter had caused dislocation in our exports," he remarked.

PROSPECTS OF GOOD CROP

Mr. Balasubramanian struck an optimistic note, however, when he said that the country "has just started readjusting itself to the inevitable results of devaluation." He noted that with the prospect of a good agricultural crop this year, "there is every reason to hope for an easing of the food problem and with it for an improvement in the general economy of the country." He added: "It should be possible for us to look forward to a greater surplus from the agricultural sector which would help us to increase our exports."

Analysing the 1966-67 performance, Mr. Balasubramanian said : "In 1966-67, even though there have been larger exports as shown by the increase in the value in rupees, there has been a drop in terms of foreign exchange earnings due to devaluation. It should be realised that the absence of some improvement in export performance would have resulted in a drop in foreign exchange earnings to the extent of 57.5%, that is, to the extent of devaluation. In other words, the fact that we have been able to regain the lost ground, at least partly to the extent of about 30%, is in itself evidence of the progress made and is indicative that we are on the right track.

"Maybe, we have not been able to wipe off the entire deficit on account of devaluation, but this has been mostly due to factors which are beyond our control. To give an example, the drop on account of guar gum alone has been Rs. 41.44 lakhs. In this case the drop has been due to acute scarcity conditions in Rajasthan rendering the raw material position very difficult, as well as due to the fierce competition from Pakistan, where a more attractive export assistance in the form of a 30% bonus voucher is reported to be in vogue. Thus, if due allowance is made for these somewhat extraordinary factors, our exports could well have touched Rs. 5 crores."

DEMAND FOR FRUIT JUICES

Sounding a note of hope, he declared: "On present reckoning, I should anticipate an export performance of the order of about Rs. 6 crores for the year 1967-68. This optimism arises from a very good spurt in the demand for our fruit juices which alone, during the current year, would account for about Rs. 1.5 crores."

He noted that a few units for dehydration of fruits and vegetables were likely to come up in various parts of the country. Another important step had been the formation of an association for the development of protein foods. "The International Protein Congress at Mysore and the meeting that followed at Bangalore have served to focus public attention on this vital problem of fighting protein deficiency. I hope this will lead to the establishment of units for the manufacture of high-protein foods to supplement our normal diet," Mr. Balasubramanian said.

A big problem which the food processing industries had had to live with during the current year was the acute shortage of sugar, he said. But the export requirements had been fortunately met in full, helping many units to continue with their exports. He was happy to say that exports had not suffered for want of sugar.

"It has, however, to be recognised that no industry could be 100% export-oriented, much less the food-processing industry. Exports have to be built up only on a stable and strong foundation of a domestic market which could to some extent absorb the losses on exports. I am afraid we are as yet nowhere near a

solution to this problem of how to build up a stable domestic market," he said.

DEFENCE REQUIREMENTS

He pointed out that the food-processing industries also played a very vital role in meeting the defence requirements and were, therefore, of strategic importance to the country. "The needs of the civil, defence and export sectors, which are interconnected and interdependent segments of the whole, have perforce to be taken together and cannot be considered in isolation. On this will depend the future growth and development of the industry."

Mr. Balasubramanian dealt with these other subjects :

Sugar : The decision to partially decontrol sugar has caused some anxiety to the industry. There is fear that the decontrol, together with the difficult supply position of sugar due to low levels of production, would add to their troubles and may well result in their being priced out both in the domestic and international markets.

A solution to this problem is not likely to be easy or fully satisfactory. Efforts will be made to ensure that the industries do not suffer unduly on account of sugar shortage. Nevertheless, the industries have to be prepared to meet, by and large, their requirements from the open market share of 40% of the sugar production.

He assured the industry: "We shall do our best to persuade the Government to lighten the burden by meeting a part of the needs from the controlled 60%, although I am not in a position to give any commitment on this account.

"The question of issuing sugar at international prices to exporters of sugar-based items is also under the active consideration of the Government."

Raw material bank : With the OTS can coming under priority industries, the supply position of cans has considerably eased. Even so members have experienced difficulties in securing cans of particular sizes needed for the markets abroad. A revision of the priority classification is under the Government's consideration. Besides imported tinplate, the industry also needs chemicals, preservatives and packaging materials like pectin, citric acid, parchment paper, etc., which have to be imported. Past experience indicates that the tinplate crisis occurs at frequent intervals. "It will be worthwhile to explore the feasibility of forming a raw material bank which could import and store these items for supply to the industry. Perhaps the MMTC and STC could be entrusted with this task."

Balancing equipment and finance for modernisation : Adequate foreign exchange should be provided for a bold modernisation programme of the food processing industry. The creation of a separate cell in the Ministry of Commerce for processing raw material and machinery requirements from the export angle has been a welcome development. But the industry is yet to realise the full benefit of this development. Something immediate has to be done if our food processing units are to play a more vigorous role in the export effort.

"I hope that foreign exchange could be allocated to such of the units as are engaged in export efforts on a selective basis with a stipulation that they should effect at least an additional 50% exports during the next three years over and above their average export performance."

Export assistance : There is need for export assistance and measures should be realistically framed and implemented, keeping the basic object in view if fruitful results are to follow. In the case of food-processing industries, by and large, about 14% of the production of the fruit and vegetable preservation industry is already being exported. The percentage varies for other items and our efforts should be continuously to improve our performance.

COMPETITIVE PRICES

"Exports have to be at internationally competitive prices which, for us, means exporting at a price much lower than what could be secured in the domestic market. It will not be possible for the industry to continue to export at a loss over a period of time unless they have a sustaining domestic market which could offset part of these losses."

He called for a "clear-cut policy" spelling out the extent to which the Government could go in assisting the industry and how much the industry should bear by way of losses on exports. "In my view, it would be a fair and equitable proposition if the Government could consider package proposals involving Rs. 20 lakhs and above for shoring losses to the extent of 50%, leaving the other 50% to be borne by the industry. This would enable processing of package deals more expeditiously."

The present quantum of assistance against exports was inadequate. Members also experienced difficulty in securing even the meagre available facilities. Expeditious and timely assistance was as much essential as the quantum of assistance.

"It is in this connection that I would like to commend for the consideration of the Government the question of permitting selective inter-changeability of entitlements within the same food-processing sector. The foreign exchange earnings that are generated through export of processed food items should be allowed to be ploughed back and help to broaden and diversify the base of production. This would be possible if no undue restrictions are placed on inter-sectoral ploughing back within the same group of food industries."

As the regulations now stood, the entitlement earned by, say, a chutney manufacturer cannot be transferred to another manufacturer of a processed food

item other than chutney. "In my view, as long as any bona fide exporter wants to endorse his entitlements in favour of another bona fide manufacturer with the **permission of the Government,** there should be no objection, in principle, to permitting such selective transferability. This would ultimately help in increasing exports which is, after all, the basic objective of the assistance scheme.'

DRAWBACK DISBURSEMENTS

There was inordinate delay in regard to disbursements of drawback at the revised rates of tinplate, though it had nearly been a year since the increased rate of drawback was announced. Considerable sums had been locked up and hardship had been experienced by the fruit and vegetable preservation units on this score. This problem should be sorted out immediately so that the industry could get the much-needed relief.

In the annual report of the Working Committee of the Council, the Secretary, Mr. P. S. Srinivasan, said that during 1966-67, canned and bottled fruits and vegetables had shown an increase from Rs. 43.41 lakhs during 1965-66 to Rs. 69.92 lakhs (61%) during 1966-67; pickles, chutneys and condiments from Rs. 44.72 lakhs to Rs. 60.59 lakhs (35%); confectionery from Rs. 8.11 lakhs to Rs. 9.03 lakhs (11%); biscuits from Rs. 24.87 lakhs to Rs. 32.59 lakhs (31%); wheat bran from Rs. 78,505 to Rs. 28.7 lakhs (3556%); cocoa products from Rs. 8.25 lakhs to Rs. 19.48 lakhs (136%); other processed foods from Rs. 17.67 lakhs to Rs. 40.32 lakhs (128%)—the increase being accounted for mainly by a step-up in the exports of Nescafe instant coffee.

Instant tea is also another item which has been introduced in the U.K. and the U.S.A. markets.

Exports of papads, mainly manufactured on a cottage basis and with socio-economic benefits, have increased from Rs. 11.44 lakhs during 1965-66 to Rs. 17.77 lakhs during 1966-67.

EFFECTS OF DEVALUATION

The exports of Coca-Cola concentrate and guar gum have shown a decline.

"Among the reasons for the decline (in processed food export earnings) the major factor has been the dislocation caused on account of devaluation and the unsettling effects that followed thereafter. It took considerable time for the trade and industry to reconcile themselves to devaluation. Even so, the scaling down of the export assistance measures in the form of reduced cash and import entitlement benefits on the assumption that devaluation had imparted some degree of bargaining strength to the Indian exporter has largely been belied by the subsequent behaviour pattern of our exports. Rather, the non-monopolistic character of our processed food items, the hard bargaining resorted to by the overseas buyers enjoying a multiplicity of sources of supply for these items, the mounting price curve of raw materials, packing materials and components that has robbed away the benefit of devaluation, a consequential mark-up to the extent of 57.5% in respect of the imported materials — all these have had a depressing effect on the performance of the industry of which export is but one segment," the annual report said.

DEHYDRATED BANANA

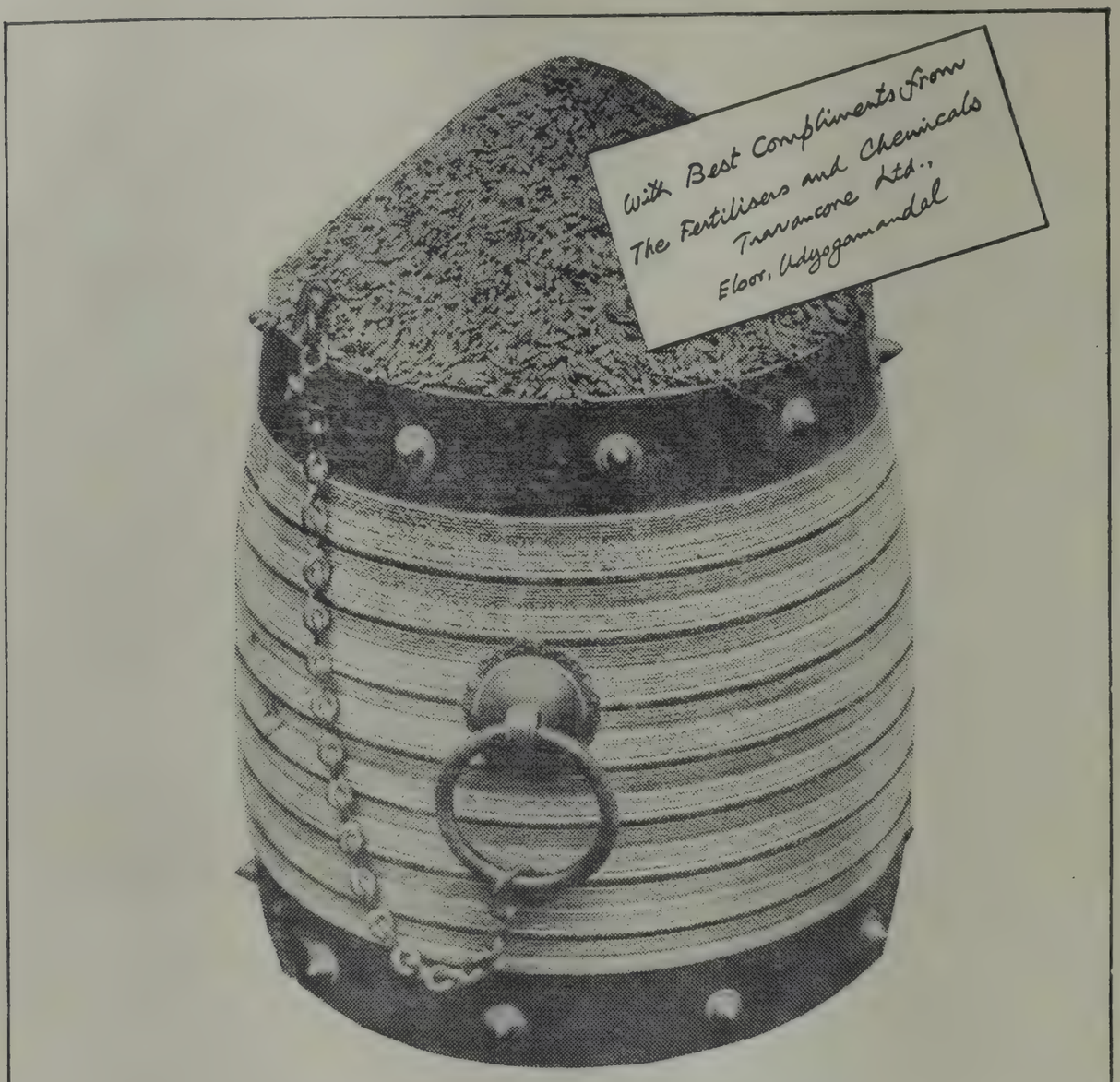
It said the Council had forwarded samples of dehydrated banana powder for product test and test-marketing to ascertain the market possibilities in Scandinavian countries. The initial reaction has been encouraging and it is being pursued.

For some time past the Council has been investigating the possibilities of marketing typically Indian sweets like halwa, rasgolla, etc., in the United States. Indian halwa has been found to be a little sticky. Accordingly, the Council suggested reduction of the element of stickiness and special samples in the form of "halwa bar" have been forwarded to the prospective buyers in the United States. The Council's assessment is that the halwa bar, in the form of 100-gramme packs, could be marketed in the States which should prove popular among school children since it would serve as a supplement to confectionery. (See next page for table on export trends of processed foods).

EXPORT TREND OF PROCESSED FOODS

Quantity in Kg.
Value in Rs.

S. No.	Name of the Products	1962-63		1963-64		1964-65		1965-66		1966-67	
		Qty.	*Value*	*Qty.*	*Value*						
1.	Canned and bottled fruits and vegetables	9,67,601	15,95,812	12,66,526	21,28,896	17,18,053	35,59,585	23,67,182	43,40,776	27,66,610	69,91,587
2.	Pickles, chutneys and condiments	20,01,359	40,37,305	19,50,959	40,28,220	25,96,051	49,28,744	24,38,286	44,71,717	22,28,553	60,58,715
3.	Canned & frozen meat and poultry products	—	5,25,455	—	1,172	—	—	—	—	86,003	1,70,332
4.	Malted milk products, ice-cream	192	1,111	1,164	5,332	2,711	12,626	—	55,755	7,117	30,338
5.	Confectionery	38,385	1,11,991	2,02,448	3,66,284	2,69,493	5,63,279	4,99,208	8,11,330	5,56,497	9,02,874
6.	Biscuits	1,07,216	3,89,841	1,75,658	6,17,228	3,97,041	15,07,635	9,88,488	24,87,389	9,54,914	32,59,302
7.	Starch and its derivatives	18,62,504	20,27,811	35,34,361	26,04,458	—	35,84,294	35,50,164	23,03,426	42,66,877	26,25,387
8.	Guar gum	—	89,96,144	—	164,41,038	—	1,61,60,142	—	1,56,60,512	—	1,15,16,828
9.	Coca-Cola concentrate	—	2,16,431	—	4,34,778	—	14,05,226	—	59,43,503	—	42,19,471
10.	Wheat bran (in tonnes)	30,754	75,79,115	21,189	50,26,697	—	13,92,149	233	78,505	79,69,251	28,70,191
11.	Other processed foods: tea mixed powder, coffee mix powder and other breakfast foods, papads, etc.	8,68,511	11,73,415	8,14,912	10,35,752	—	14,58,054	5,73,444	17,67,103	7,08,364	40,31,775
12.	Butter and ghee	11,073	74,832	13,310	1,07,235	11,445	1,07,966	7,025	74,070	12,103	73,679
13.	Cocoa powder, cocoa paste, chocolate and confectionery	1,31,848	6,51,012	2,36,289	8,42,852	1,49,991	6,96,316	2,01,883	8,25,068	3,75,900	19,47,997
	TOTAL		2,73,80,275		3,36,39,942		3,53,46,016		3,88,19,154		4,46,98,476



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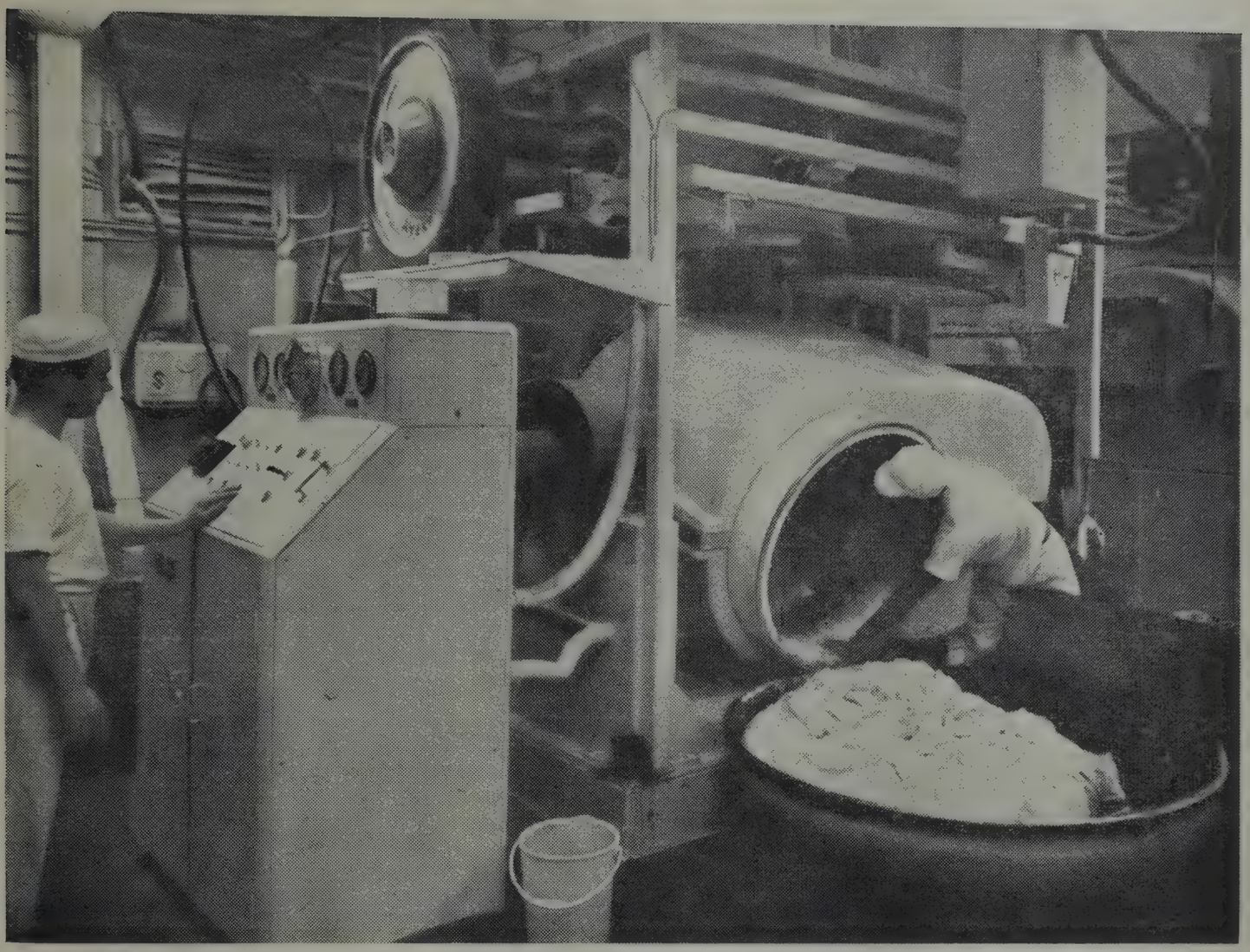

HIGH-SPEED DOUGH-MIXING MACHINE

IN response to a request from one of its readers, The Food Industries Journal is publishing this high-speed dough-mixing machine mentioned in Anthony Woollen's article on Food Processing in Britain, which appeared in the July issue of the Journal.

Picture shows 450 pounds of fresh dough being emptied from a large mixer-developer at a British baking industries research station at Chorleywood, Hertfordshire. This machine, based on the British Baking Industries Research Association's work, is made by George Tweedy and Co. Ltd., of Burnley, Lancashire. After emptying, the mixer rights itself and is automatically filled with fresh ingredients. The control panel is on the left. The cycle lasts five to six minutes.

The Chorleywood Process—a revolutionary bread-making process—has been evolved after three years of painstaking research by the Association. The new process takes its name from the Association's research station at Chorleywood.

In conventional bread-making a batch of dough is mixed and allowed to ferment for several hours. The bulk dough is then divided and shaped and allowed two more periods of fermentation, or proof, before baking. Much interest has been aroused in recent years by continuous processes which maintain uninterrupted bread production. These processes have commonly made use of the fact that intense mechanical agitation of the dough can bring about the desirable physical changes normally resulting from bulk fermentation.

The work which led to the Chorleywood Process started as an evaluation of the factors involved in the production of continuously mixed and mechanically developed bread. The outcome has been the elaboration of a mechanical development process in which the important factors have been defined in such a way that they can be applied equally to batch and continuous systems.

ADVANCES IN PRESERVATION OF FOOD BY IRRADIATION

By **BHUPENDRA V. RANDERIA**, M.S. Tech. (U.S.A.)

Managing Partner, General Foods Corporation, Dombivli.

WITH the rapid advances in science and technology, newer processing and preservation techniques are increasingly being tried by modern food technologists. Radiation as a method of food preservation has advanced in two decades from an exciting laboratory curiosity to a commercially feasible method. It has attracted the attention not only of food technologists but the scientists from different disciplines all over the world.

The attempts of food technologists to utilise ionizing energy date back almost to the time when Professor Bernard E. Proctor of the U.S., studied the effects of X-rays on hamburger in 1943. The research in this field is carried out in the U.S., Russia, West Germany, England, France, Japan and during recent years in our country. The contributions of foreign research laboratories have been very great and today this method of preservation as a result of the interdisciplinary approach by scientists from all over the world begins to appear to offer some promising limited uses for the civilian economy in the next few years.

Irradiation is the process of sterilising food products with the help of radiation. There are two types of radiations that may be of use in the field of food industry (I) Electrons (Beta particles which carry a negative charge). (2) Electromagnetic gamma rays or X-rays.

Food irradiation research has yielded many developments in equipment and radiation sources. Perhaps the most recent and important development has been the invention of the 'Insulated core transformer' by Dr. R. J. Van de Graaff, the famed physicist and inventor of the electrostatic accelerator that bears his name. It is the first breakthrough in sources of ionizing energy making it possible to have intense beams of ionizing energy reliably produced and controlled.

The most useful electromagnetic radiations are those produced during decay of radioactive Cobalt (Co^{60}) or radioactive Caesium (Cs^{137}). The advantages and disadvantages of these two types of radiation have been argued for many years. The advantages of the machine sources of radiation are (i) beams of very high intensity can be produced, (ii) beams of the negative charge on the particles, these beams can be manipulated by the use of electromagnets. Machines are also inherently safer than radioactive sources because they can be switched off. Radioactive sources continuously produce radiation which is of lower intensity than machine sources but is less prone to mechanical failure. The gamma rays are very penetrating whereas electrons of the energy proposed for use in food irradiation will only penetrate a few centimetres of a foodstuff. It can be seen that the two types of radiation complement each another. The type of radiation to be used depends upon the thickness and contents of a package together with economic considerations.

Ionizing radiations are themselves hazardous to man and all sources of such radiation must be shielded.

TABLE I

Potential applications of ionizing radiations in the food industry.

(1 rad=an energy deposition of 100 ergs per gram. 1 Mrad=10^6 rads)

Application	Dose required
Inhibition of sprouting in root vegetables e.g. potatoes	10,000 rads
Destruction of parasites in meat	10,000 rads
Disinfestation of grain	20,000 rads
Destruction of moulds and yeasts e.g. in fresh fruits	250,000 rads
Pasteurisation of fish	300,000 rads
Destruction of Salmonella	500,000 rads
Sterilisation of meat	4,800,000 rads
For comparison, the lethal dose for man is	700 rads

Table 1 shows the doses of radiation required for a variety of uses in the food industry.

Radiation causes changes in bacteria which result in their death but it is not selective in its action and it also causes chemical changes in the food constituents. The dose of radiation to kill bacteria varies from one type to another and some types are more resistant than others. To reach the same level of safety with regard to Clostridium botulinum as is achieved in heat processes of high pH canned foods such as meat, a dose of radiation of 4.5 Mrads is required. On the other hand Salmonella food poisoning organisms are much more sensitive to radiation and require only 0.5 Mrads. These examples illustrate how radiation can be used either to sterilise a food (using the term as it is normally employed in the food industry, 'Commercial Sterility', or secondly to pasteurise it, that is treat it with sufficient radiation to eliminate a selected group of organisms which may be useful to man or damaging to food on storage.

Basically the largest single problem which is holding up commercial utilisation of irradiated foods is

the production of undesirable side reactions brought about when certain foods are treated with high doses of radiation to bring about complete sterilisation. Despite the fact that such data indicate little or no loss in essential nutrients in radiation sterilisation even with excess doses than required for sterility of some types of foods, large differences may be observed in flavour, odour and perhaps colour and texture of food irradiated by much lower doses of radiation. Thus while the degree of change in a particular nutrient in an irradiated food is so small as to be outside the accuracy of modern physiochemical instrumentation, it is sufficiently great to be easily detectable by the human palate and olfactory system. For example, table salt becomes yellow in colour on irradiation; in the case of cheese and beer both lower and higher doses affect the flavour. Milk powder develops a stable flavour when treated with high doses of radiation.

VARIOUS DEVICES

Various devices are employed to improve the product. For example, charcoal scavengers are used to absorb offensive odours. Irradiation of meat slices in brine which leaches undesirable constituents, addition of tomato extracts to mask quality changes could improve the product. At present we lack experience in this country of the value of these procedures. We still have to judge ourselves whether such products would be of good enough value and quality to be of commercial interest.

Technological and fundamental studies till now have shown three practical methods or combination thereof of reducing undesirable side reactions. (1) Irradiation in frozen state; (2) removal of oxygen; and (3) addition of free radical acceptors.

Freezing decreases the diffusion rate of free radicals and thus removes the causes of undesirable changes. The presence of dissolved oxygen increases the number of free radicals and hydrogen peroxide. Thus the elimination of oxygen substantially reduces the degere of side reactions. Free radical acceptors compete with the molecular components of food for the free radicals and thus protect particular components. A good free radical acceptor has a greater affinity for the radicals than the components to be protected. The reaction may be linked with the components to be protected. The reaction may be linked with the "Lock and Key Mechanism" of biochemistry in which the flavour molecule and acceptor are both keys which help to lock the free radicals. If the free radical acceptors are not present, the flavour molecules fit the lock; if they are present they will compete with the flavour molecules to fit the lock.

ADVANTAGES

There are many advantages of preservation by the irradiation technique. In addition to complete sterilisation of food products either in the hermetic package or in continuous passage through radiation equipment there are numerous other intriguing uses of somewhat less drastic radiation treatment not necessiating complete sterility which might be compared roughly to pasteurisation for the temporary preservation of perishable foods and commodities.

(a) **Surface sterilisation :** Food commodities such as Frankfurters may have their shelf life significantly increased by reducing surface contamination by treating with a low dose of radiation. In the case of fruits and vegetables when sterilised with radiation the texture becomes softer with doses greater than about 0.5 Mrad and even in the absence of microbial spoilage enzymatic changes in many fruits would limit the storage life. Recently surface irradiation of fruits gave promising results. Even with 2.5 Mrads given only on the surface no changes in quality could be detected with apples and pears.

(b) **Preservation of meats :** The research report of the American Meat Institute has pointed out that there is a five-fold increase in the shelf life of meats irradiated with low doses of gamma radiation. Certain kinds of meat products like hamburg and steak could be treated by this means with dosages of under one megarad in order to destroy the Pseudomonas and other organisms of this type. After this treatment, the meat is stored at a temperature above freezing and below 40°F in order to prevent germination of the spores which are present in the meat.

Sea foods appear to show more promise. This is especially true in our country. Fresh fish products from the sea coast are usually not fresh or they are frozen. In the latter case the frozen products are acceptable and convenient to consumers. However, there may be a market for fresh sea food products and radiation food preservation opens up a new approach.

(c) **Disinfestation of grains products :** It has been found that destruction of insects in grains is brought about by treating grains with low doses of radiation.

(d) **Inhibition of sprouting in vegetables :** It has been found that a low dose of 10,000 rads inhibits sprouting in potatoes, onions and carrots and thus the storage life of these vegetables may be increased by many months. Whether or not this method can compete with chemical means of inhibition is as yet unknown.

For many foods a low dose of radiation does not significantly affect the quality but kills a sufficiently high proportion of the contaminating microorganisms to extend appreciably the period before microbial spoilage occurs. The gain is more when the product is held in a chilled condition after irradiation. In the case of refrigerated foods, a low dose of radiation inhibits microbial growth and the product could be kept for more than four times its normal storage life.

IRRADIATION IN DEVELOPING COUNTRIES

In underdeveloped countries where refrigeration is costly products like meat can be produced for markets everywhere thus giving the farmer some in-

centives to produce more meat. In South America, the country is producing more meat but refrigeration is still a problem like ours.

Many foods are preserved by the freeze-dried process in which water is removed after the food has been frozen. Food treated this way has a longer shelf life in any climate. They need only polythelene packaging to prevent external contamination. But because of the higher cost, preservation by the irradiation technique will be an advantage. Another advantage is that less time and labour are consumed in sterilisation by radiation compared to some conventional methods.

In our country the Bhabha Atomic Research Centre has been conducting several experiments in food preservation by means of high and low dose radiation. The latter in combination with mild heat, cold storage and ultrasonic waves has shown to extend the shelf life of onions from 12 to 24 weeks, mangoes from 2 to 4 weeks, potatoes from 14 to 28 weeks, semi-dried bananas from 2 to 14 weeks and in the case of bread and chappatis from 10 days to 50 days.

IRRADIATION OF FISH

The world-famous Bombay duck can now be preserved for a longer period with a low dose of gamma radiation. Fish is available in plenty on the west coast and this could be exported in the dehydrated form. Fresh Bombay duck gets spoiled in six to eight hours at room temperature. When stored in ice it remains in good condition for three to four days. In the case of sun drying or deep freezing, because of softer muscles, the fish gets disintegrated, because of high temperature in sun drying and low temperature in deep freezing. Irradiation of cleaned and filleted Bombay duck extends its storage life to about three weeks in the case of fresh fish and can be about twelve weeks in the case of semi-dried fish. Today a total of about 1.1 million tonnes of fish is being caught in India out of which 70 per cent has to be marketed fresh. As a result there is considerable spoilage and wastage. Similarly we produce over 16 million tonnes of fruits and vegetables while barely 10 million tonnes reach the consumers in India. Preservation by the irradiation technique would reduce wastage to a greater degree and would also help in improving our methods of distribution.

Many of us might feel that food preservation by irradiation methods is strictly for highly developing countries of the world and the developing countries should be content first with conventional methods of food preservation. As a matter of fact, developing countries should be encouraged to educate personnel in radiation technology and to work within their own research laboratories on problems of importance to their own particular country and radiation centres should be set up preferably on an international basis to establish and develop close co-operation among radiation specialists.

The following problems faced by many developing countries in the world today can be solved with the help of irradiation methods of preservation :—

(I) The disinfestation of dried and smoked fish in Africa.

(2) The sanitation of fish meal.

(3) The disinfestation of fresh fruits and vegetables for the export market.

(4) The disinfestation of grains.

Even today we have no complete answers to the following international questions because of no proper methods of food preservation.

How many pounds of fish are not caught in certain areas of the world because there are no means of preserving them? How many pounds of dried or fresh fruits and vegetables are rejected in internal commerce because of insect infestation? How many tons of grains are lost because of insects? How many tons of Salmonellae-infected eggs and egg products have been shipped in the international market? In view of these questions alone can we doubt the potentiality of radiation as a possible force on a world-wide basis ?

It is also worth while to consider the cost of production by the irradiation technique. It is too early to be dogmatic about the cost of food irradiation. Nevertheless, the process does cost money. Even if the actual radiation is cheap, transport and storage can be costly. Since some expensive foods like meat and meat products require high doses of radiation to bring about complete sterilisation compared with cheaper foods like potatoes where a low dose of radiation is required for preventing them from sprouting, the general conclusion seems to be that though irradiation may not be especially cheap, a really promising process would not fail on economic grounds. It is still questionable whether these processes can be considered " really promising " when compared with other methods of food preservation like improved refrigeration, gas storage, etc. In certain cases, preservation by radiation doses offers unique advantages but still we lack enough detailed knowledge of the potentialities of irradiation to make precise comparisons.

There are certain questions which still need to be clarified in preservation by the irradiation method.

(1) Does food treated by this method become radioactive ?

It appears from the research data available that food does not become radioactive provided discretion is used in selecting the radiation source. There are no evidences of formation of unusual toxic substances though peroxide for example can be formed in irradiated foods. Evidence regarding carcinogenicity, though incomplete, is so far negative with the excep-

tion of such artificial systems as heavily irradiated steroid concentrates painted on animals.

The situation regarding nutritional adequacy is more confused. The major nutritional constituents are not appreciably affected by sterilising doses but vitamins may be destroyed, some of them to a larger extent. In the case of canned foods, thiamine in tuna fish dropped to 33 per cent, the total ascorbic acid in evaporated milk dropped to 68 per cent, riboflavin in apricots dropped to 77 per cent. By comparison, foods rich in these vitamins as for example ascorbic acid in orange juice, peas, spinach and tomato juice or riboflavin in evaporated milk and luncheon meat showed no significant losses, while frozen foods retained most of the vitamins very well. Consequently, animals fed wholely on heavily irradiated foods can develop symptoms of certain vitamin deficiencies. Examples are infertility, blindness, stomach haemorrhage, etc. When appropriate vitamins are added to the diet, the symptoms disappear. Accepting the necessity for supplementation of some vitamins, it would seem that irradiated foods, while perhaps not quite as good as fresh foods, offer no exceptional hazards.

SCOPE FOR IRRADIATION METHODS

The use and application of ionizing energy know no international boundaries. Considering particularly the under-developed countries and the developing countries much can be done in the conservation of foods. Ionizing energy can be used

(1) to disinfest grains and grain products;
(2) to inhibit sprouting of tubers;
(3) to preserve certain protein foods such as sea foods and meat;
(4) to improve public health aspects of certain foods by eliminating pathogenic organisms, such as removal of Salmonellae from egg and egg products, poultry and other foods and feed stuffs;
(5) to sterilise some foods like pork and pork products (particularly cured products) where the problem of undesirable side reactions are not so acute.

It is also predicted that if a major breakthrough is achieved on the removal of undesirable side reactions, more radiation sterilised products will be marketed provided industry can see that these products offer a good marketing potential and can compete with other accepted methods of preservation in terms of convenience, accepatance, price, quality and nutrition.

From our defence point of view, radiation treated foods will be utilised more rapidly within the next few years. Just a few years ago Canada carried out a large-scale experiment on potato preservation using a dosage of about 15,000 rads in order to inhibit sprouting. Whether this will be successfully continued in the future remains to be seen.

Obviously this is but a beginning. This method may not replace canning, freezing or dehydration but it will supplement and complement our present methods of food preservation.

CFTRI TRAINING CENTRE

The International Advisory Committee for the International Food Technology Centre at the Central Food Technological Research Institute, meeting in Bangalore in July, felt that the centre should be continued on a long-term basis.

The committee emphasised that the effective application of food technology would help the development of food processing industries and the increasing of food supplies in South and South-Eeast Asia through improved storage, handling, distribution, processing and marketing.

The committee expressed satisfaction at the participation by 100 trainees from 11 countries in short-term training courses and two-year courses leading to the M.Sc. degree of Mysore University.

Of the 23 students awarded degrees at the convocation of Mysore University, 16 were from India, five from Thailand and two from the Philippines.

The International Training Centre at the CFTRI was set up in 1965 in accordance with an agreement between the Union Government and FAO. The Canadian people make their contribution generously to the centre through the Canada-Mysore project of the Canadian Hunger Foundation. Technical personnel from South and South-East Asia are trained at the centre in modern methods of food processing, packaging and storage.

Besides the two-year post-graduate course in food technology, the centre conducts short-term courses in specific fields for technical personnel and extension workers.

Six short-term courses have been organised so far. They were: fruit and vegetables technology; infestation control in raw and processed foods (twice); meat, fish and poultry technology; analysis, standardisation and quality control in food processing industries.

QUESTION-BOX

We have an inquiry from a Surat firm about the availability of machinery for the manufacture of vegetable ghee. Manufacturers interested in supplying the required machinery may write to The Manager, The Food Industries Journal, 3A, New Queen's Road, Bombay-4, for further particulars. The names of interested firms will be published in this column.

Readers of The Food Industries Journal are welcome to address their queries to the Editor about matters pertaining to the food and allied industries. Every endeavour will be made to answer them with the help of experts in the line.

FERTILISER INDUSTRY IN INDIA MAKES HEADWAY

By M. K. K. NAIR,

Managing Director, Fertilisers and Chemicals Travancore Ltd.

INDIA is an agricultural country. Seventy per cent of its population is engaged in agriculture. The total area under cultivation in India is 157 million hectares. This is about 52 per cent of the land area of India. Studies have shown that this area cannot be expanded very much. Increased production of food grains and other agricultural products have, therefore, to come from the area already under cultivation. Fertiliser is the major input in any programme of intensive cultivation of land. The need for development of a fertiliser industry in the country thus is paramount.

The fertiliser industry in India really started making headway only after the country attained independence in 1947. At that time the only unit for the large-scale production of ammonia was the Fertilisers and Chemicals Travancore Limited, established in the mid-forties in the erstwhile princely State of Travancore.

Even before the programme of planned development was introduced through successive five-year plans, fertiliser production received the attention of the Government of India. A major unit with a capacity of 75,000 tonnes of nitrogen based on coal was set up at Sindri in Bihar, which went into production in 1951.

ROLE IN PLANNING

The first Five-Year Plan laid emphasis on the various measures required to stimulate agricultural production. Fertilisers thus assumed a major role in planning for agricultural production. The private sector to which the fertiliser industry was assigned under the Industrial Policy Resolution of 1948, however, did not come up mainly for want of resources. No new fertiliser factory was set up during the First Plan. Based on this and taking into consideration the fact that the fertiliser industry was highly capital based on the one hand and low profit-yielding on the other, the Government of India, while revising its industrial policy in 1956, classified the fertiliser industry in the category of industries on which private enterprise would also be expected to supplement the efforts of the State.

This change in the policy at the beginning of the Second Plan gave a fillip to the fertiliser industry. The public sector undertook to establish additional capacity. The private sector did not, however, put up any worth-while proposal. A new project was taken up at Nangal for a capacity of 80,000 tonnes of nitrogen based on the electrolytic process. Another project taken up in the public sector was at Rourkela where a million-tonne steel plant was being set up. As the steel plant had adopted the L.D. process for making steel, considerable quantity of nitrogen was available. It was, therefore, found desirable to utilise the by-product gases as well as the nitrogen available to set up a fertiliser plant. The Rourkela plant was planned for a capacity of 120,000 tonnes of nitrogen. Towards the end of the Second Plan, another factory was taken up in the public sector. This was at Trombay near Bombay. The capacity proposed was 90,000 tonnes of nitrogen and 40,000 tonnes of P205 a year. A fertiliser plant based on the lignite deposits at Neyveli was also concieved as a part of the major Neyveli Lignite Project in Madras State, with a capacity of 70,000 tonnes of nitrogen. During the Second Plan period Sindri and FACT also undertook an expansion of their capacities.

At the end of the Second Plan, the total capacity

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We have no May and June issues to spare because the response to our venture was very much beyond our expectations.

Those willing to sell us the May and June issues may kindly write to The Manager, The Food Industries Journal, 3-A, Queen's Road, Bombay-4—BR.

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established for the manufacture of nitrogenous fertilisers was only 2,27,000 tonnes.

FLOW OF FOREIGN AID

The target fixed for the Third Plan for nitrogenous fertiliser production was one million tonnes. To enable this capacity to be achieved, the Government encouraged the private sector to come forward and participate in the development of the fertiliser industry. Licences were thus issued to many units in the private sector. In fact, when the private sector had come forward to set up nitrogenous fertiliser plants in various parts of the country, they were received with great enthusiasm. Unforunately, a foreign exchange crisis was gradually developing and the entrepreneurs had to seek assistance from abroad for setting up the projects. In this, most of them were unsuccessful. Some of the factors that inhibited the flow of foreign capital and assistance to the private sector were :—

(a) Pricing and distribution of nitrogenous fertilisers were controlled by the Government under the Fertiliser Control Order. Intending investors were not sure whether the pricing policy would be consistent with considerations of their concept of net returns.

(b) By and large distribution of fertilisers in the country was made through co-operative institutions. Intending investors were not sure whether they would have the freedom to market their products through their own arrangements.

(c) The demand for fertilisers was rather low. It required a considerable amount of promotional work to stimulate the farmer's demand. Such work involved some investment. The investor was therefore anxious to ensure that the returns would be commensurate with the total investment.

As the licence-holders could not make much headway in solving these inhibiting factors there was very little response from foreign investors. As a result, licence-holders surrendered their licences to the Government. This created a new situation which called for bold and imaginative action by the Government.

The first breakthrough in this state of impasse came with the advent of Messrs. International Minerals and Chemicals Corporation of the USA to set up a joint venture with East India Distilleries of Madras for the manufacture of 80,000 tonnes of nitrogen and 73,000 tonnes of P205. The location they selected was Visakhapatnam (Vizag) in Andhra Pradesh. When this scheme was discussed with the Government of India, questions relating to pricing and distribution again came up. The Government was able to come to a satisfactory arrangement with the entrepreneurs in regard to their future policy on both these aspects. A new company was therefore set up by the name of Coromandel Fertilisers Ltd. It commenced work in September 1964 and is expected to go into production in 1967-68.

Another fertiliser factory that came on the scene during the Third Plan period was Messrs. Gujarat Fertiliser Co Ltd., which was set up in Baroda for a capacity of 96,000 tonnes of nitrogen and 50,000 tonnes of P205. The plant went into production in March 1967. This project has also undertaken an expansion programme to establish a further capacity of 218,000 tonnes of nitrogen and 50,000 tonnes of P205.

During the Third Plan period FACT undertook an expansion programme to raise its capacity to 70,000 tonnes of nitrogen and 33,500 tonnes of P205.

The experience during the Second Plan period and the lack of pace observed during the Third Plan highligted the need for a new approach to fertiliser development. Further, there has been fast development in the processes and technology applied to fertiliser production. Influenced by the need to produce ammonia at the cheapest possible cost, so that the prices of fertilisers in the country could be kept to the minimum the Government of India was keen to set up new plants based on the latest processes and techniques. Yet another factor that influenced Government in looking for outside assistance of magnitude was the disappointing experience in the past over the delays involved in setting up fertiliser plants.

The UN Fertiliser Survey Mission, which submited a report in 1961, also indicated that the time taken to establish nitrogenous plants in India could be considerably reduced. The Government of India, therefore, felt that a crash programme for the development of the fertiliser industry was called for. It was keen to come to an arrangement of four or five units in different parts of the country with a total capacity of a million tonnes of nitrogen.

The Bechtel Corporation of the USA got together with a group of major American private manufacturers of petrochemicals and fertilisers to form a consortium to participate in this programme. The negotiations on the proposals put forward by the Consortium started in September 1964. The Consortium undertook a number of studies and were satisfied that there was ample scope for establishing the proposed capacity in the country. After preliminary discussions with the Government of India, the Consortium went ahead with a feasibility study which was undertaken with the assistance of the Stanford Research Institute, California, and the Government of India. Their study was aimed at determining the overall fertiliser requirements of the country and in particular specific regional needs. This would then provide a basis for determining the ideal locations of the plants. The study was also to evaluate the existing policies on pricing, marketing and distribution. There was visible optimism in the country when these proposals came up for discussion. As it was the intention of the Government of India to see that no impediment was placed in the way of the Consortium in the choice of sites, other proposals placed before the Government of India by the public sector units were held in abeyance.

The feasibility report prepared by the Bechtel Corporation suggested the establishment of five large-sized plants of standard design, three coastal and two inland plants for the production of one million tonnes of nitrogen, 500,000 tonnes of P205 and 250,000 tonnes of potash. The total cost of these plants was estimated at 405 million dollars. The discussions on the report commenced in Delhi in December 1964. The discussions took a considerable time. Some of the conditions proposed by the Consortium did not appear to be acceptable to the Government of India. As a Government answerable to Parliament, there were certain limitations placed on Government's freedom of action. After protracted discussions, the negotiations fell through.

On the 30th of May 1965, the Government of India received a letter from Messrs. Bechtel Corporation that it had come to the conclusion that it was not in a position to go ahead with the proposal. This no doubt was a major set-back in the fertiliser development programme of the country. Over one year was lost on account of these negotiations. Proposals for setting up plants in some of the locations which were included in the studies conducted by the Bechtel Corporation were being held up by Government pending conclusion of their discussions with Bechtel. These projects naturally lost more than 18 months on this account.

NEW APPROACH

The failure of the Bechtel proposals brought into focus the urgent need for a re-thinking and a new approach to the fertiliser development programme. The Government recognised that in view of the foreign exchange shortage they were facing, it would not be possible to put through the programme unless a substantial measure of foreign assistance was available, either in the form of joint ventures or credits. The foreign exchange shortage, which was already serious, was aggravated by the hostilities with Pakistan in the second half of 1965. Having prescribed a target for food production in the Fourth Plan, a way out had to be found.

The Government, therefore, decided to break from the past and declare a new and dynamic policy. According to the new policy, the Government welcomed private investment, both Indian and foreign, in the fertiliser industry and took a number of decisions which would make such investment attractive and profitable. These decisions related to :— (i) Financing and management; (ii) Relaxation on price control; (iii) High-level governmental assistance and speed-up of procedures; (iv) High priority for import of raw materials; (v) Credit facilities; (vi) Support for seeding programme.

Apart from the declaration of a new and dynamic policy the Government also decided that it should not lose any time in utilising the experience already developed in the public sector of the country in establishing new projects. In keeping with this thanking, the Government decided that the Cochin and Durgapur fertiliser projects should be taken up immediately. Simultaneously, the Government also encouraged the setting up of the Madras Fertilisers Ltd., a joint enterprise with the American International Oil Company and the Government of India as major partners. The collaboration agreement was entered into in May 1966 and the work on the project commenced.

NAPHTHA-BASED PROJECT

Yet another important decision taken by the Government of India during the year 1966 was the grant of approval to the Fertiliser Corporation of India in the public sector to set up a 200,000-tonne ammonia plant at Barauni in Bihar based on naphtha and an expansion of the Namrup fertiliser project by setting up a 200,000 tonnes ammonia plant based on natural gas available in the area.

While the above developments were taking place in the public sector, the Government had also given positive encouragement to a number of plants in the private sector. These included the Kanpur project proposed to be set up by ICI of UK with a capacity of 190,000 tonnes of nitrogen, a 150,000-tonne nitrogen project in Goa as a joint venture of the Birla Group of industries of India and Armour of the USA, the DCM project at Kotah (Rajasthan) with a capacity of 120,000 tonnes of nitrogen and a 220,000-tonne nitrogen plant at Mangalore to be set up by the International Development & Finance Corporation of the USA in collaboration with an Indian party. The Government also gave directions to the Fertiliser Corporation to expand the capacity of the Trombay factory by putting up another 152,000-tonne nitrogen plant with the intention of converting most of it into compound phosphatic fertilisers. The expansion of the Gujarat Fertilisers, which was under construction, by 122,000 tonnes of nitrogen had also been firmed up. In addition, the Government approved of a rationalisation programme for FACT which would result in raising its capacity to 90,000 tonnes of nitrogen and 42,000 tonnes of P205 by 1969.

Thus the capacity of nitrogenous fertilisers existing and sanctioned by 1966-67 itself was of the order of 2,857,300 tonnes as against the proposed target of 2.4 million tonnes. In the phosphatic fertilisers, however, the total capacity sanctioned was only 948,838 tonnes. This fell short of the target of a million tonnes by about 50,000 tonnes. This would be compensated if the Khetri Copper Mines Project takes shape as it would have the facility to produce 100,000 tonnes of P205 by 1971-72.

PROBLEMS OF THE INDUSTRY

A close examination of the problems of the fertiliser industry in India will reveal the following facts:

Fertiliser plants are highly capital intensive. The ultimate product, being a basic input for the millions of farmers in the country, is a sensitive commodity. Consumer prices of fertilisers are also politically sensi-

tive. Consequently, the fertiliser producer cannot normally expect very high returns. Naturally, this factor inhibits the easy flow of capital into the industry. Secondly, a substantial portion of the equipment required for a fertiliser plant has to be imported, as manufacturing capacity for such equipment has yet to develop in India. Finding foreign exchange for the purpose is a major problem.

An appraisal of the fertiliser programme in India would undoubtedly lead to the conclusion that the public sector has to play a prominent role in it. The major difficulty faced by the public sector is in regard to its foreign exchange requirements. This is an area where only institutions like the World Bank can assist. The World Bank however has so far rejected the requests made by the public sector for financial assistance.

In the absence of such assistance, the public sector may not be in a position to exploit its full potential in the development of the industry. Today, the public sector has the longest and widest experience in the fertiliser field in India. It would be in the best interests of the country to utilise that experience to the maximum extent. This utilisation, is, however, circumscribed by the limitations on the part of Government to find foreign exchange credit. Supplier's commercial credit, which can be another form of assistance, is being taken full advantage of where it is available. But such credits are not available to the full extent necessary to utilise to the maximum the talent and experience in the public sector. It is hoped that institutions like the World Bank would review their policy in this regard and consider the inclusion of requests from the public sector fertiliser industry in India also for grant of assistance.

AMMONIA PLANTS

Fertiliser technology is changing rapidly. Processes which are considered new get replaced by better ones within a period of two to three years. Economics of large-scale fertiliser plants dictate the need for employing processes and technology that would give the best return. In India, the industry is fast developing towards a state of free competition. The competitive strength of a unit will, therefore, depend upon the employment of processes and technology that would ensure maximum economies in capital as well as operational costs. The choice of processes, however, also depends on the conditions prevailing in the area. The present trend is for naphtha-based ammonia plants. Natural gas sources are rare in India. Most of the large-sized plants will, therefore, be based on naphtha. Refinery capacity is being expanded substantially. Government have indicated that no fertiliser plant would have difficulty for naphtha.

Ammonia technology has undergone a major change during the last few years. There has been a rapid change-over from reciprocating compressors to centrifugal compressors. Preference now is for large-scale single-stream ammonia plants with a minimum capacity of 600 tonnes a day. So also in respect of product plants like urea, the tendency is to go in for large-sized single-stream units. These developments call for technical appreciation of a high order. The new units that are coming up in India have, however, decided to adopt these processes and technology.

The major difficulty in the operation of plants would arise in the availability of raw materials like sulphur. The current shortage of sulphur in the world market has thrown the Indian fertiliser industry in a state of uncertainty.

The rapid development of technology in the fertiliser industry has also brought in its wake a managerial problem. This is not peculiar to India. However, it is more poignant here than in any other country. Efforts are being made to get as many technologists and managers trained in the new processes and plant operations. Yet it must be admitted that in comparison with the task there are some limitations. These deficiencies can be rectified and set right only as the plants go into operation and the operating personnel gain experience.

PLANT & EQUIPMENT

The Indian fertiliser industry today has to inevitably import substantial quantities of plant and equipment. For the last few years attempts have been made by the Government to set up some units for the manufacture of such equipments. Two such units, one with Czechoslovakian collaboration and another with Rumanian collaboration, are on the way. When they are established, they will no doubt meet a good portion of the requirements.

Sales promotion is a major programme in which not only a long-term interest of the industry but also that of the national economy is involved. Whereas on feriliser distribution the responsibility is shared between the Government and private agencies, on market development the burden is shouldered mostly by the State. The Government undertakes the task of research on crops and fertilisers through the Indian Council of Agricultural Research and agricultural colleges. Basic extension work is also done by the State through the Departments of Agriculture and Community Development. In the field of agricultural credit also the Government is playing a major role through the co-operative agencies.

During the last few years, a lot of effort has been put in in research and technology development in the fertiliser industry. These activities are mostly confined at present to the Fertiliser Corporation and FACT. Several useful results have been achieved by the research workers in the last few years.

One of the most important achievements in the field is the discovery of the process for the utilisation of by-product gypsum for the manufacture of ammonium sulphate. By-product gypsum arising out of the wet phosphoric acid plants is usually thrown away all

over the world. The new process developed by FACT has enabled the country to save considerable foreign exchange, which would otherwise have been spent on the import of sulphur or gypsum. The 400-tonne plant now working in the Udyogamandal unit of FACT has led the way not only for the maximum utilisation of by-product gypsum, as a substitute for natural gypsum, but also for other fruitful research in the utilisation of by-product gypsum.

The research divisions in the fertiliser industry have successfully introduced a number of process improvements. The Fertiliser Corporation has evolved its own catalysts. Thus research and development work is receiving the attention it deserves in the fertiliser industry today.

DESIGN UNITS

Till some time ago, most of the engineering and design work required for fertiliser plants set up in India had to be done abroad. The Fertiliser Corporation and FACT have their own engineering and design units in operation now. These units are now in a position to undertake the complete planning, designing, construction and commissioning of a fertiliser plant. Processes which were not available in the country have been secured by agreement from abroad. Thus the country has, between the two units, the know-how for setting up plants based on solid fuels as well as liquid fuels and gas. This will certainly quicken the pace of development of the industry in the country.

The future of any industry would depend on the following main factors:—

(a) The market;

(b) The availability of raw materials;

(c) The returns on investment.

The Indian market will take a long time to attain saturation provided an intensive fertiliser promotion programme is undertaken by the manufacturers. The national planners have laid great stress on increasing irrigation facilities in the country. Development of irrigation will therefore continue to be one of the major objectives in the successive five-year plans to come. In the Fourth Plan the provision made is Rs. 9,640 million for major irrigation projects (including flood control) and Rs. 5,200 million for minor irrigation schemes. Increased availability of water will lead to an increasing demand for fertilisers. So also, the success achieved by the improved high yielding varieties of seeds during the last few seasons has roused the interest of the Indian farmer. Such seeds respond profitably only to high doses of fertilisers. These two major factors alone will help the continuous growth of fertiliser demand.

RAW MATERIALS SUPPLY

The major raw materials required for the industry are naphtha, rock phosphate, sulphur and potash. Naphtha supplies are expected to be adequate. Refinery capacity is being continuously expanded. Fertiliser producers need not therefore have any apprehensions in regard to availability of naphtha.

Rock phosphate sources are plenty. More are under development in different parts of the world. Availability of rock phosphate is not therefore in doubt. The Government assurance that foreign exchange will be made available for imports of rock phosphate should give the necessary confidence to the investor.

Sulphur raises the most crucial problem of the industry today. At present there is a world shortage of sulphur. Immediate chances of the position easing are remote. Unlike rock phosphate, sulphur sources are not many. Prices have gone up by 160% in the course of a year. Naturally the producer is getting quite concerned over this problem.

In a free and competitive market, an industry's returns will depend upon its efficiency in production and marketing. Investment costs in India are high compared to costs in other countries, largely due to the need for importing substantial quantities of equipment and the customs duty leviable. As among firms who compete in the field, the advantages or disadvantages on this account of the cost of raw materials are more or less equal. Financial success can therefore result only from managerial efficiency and technical skills employed in producing and marketing the products. When such skills of a high order can be provided, returns must necessarily be attractive.

FUTURE OF INDUSTRY

The future of the fertiliser industry in India is closely tied up with the future prosperity of the country. The growing millions need food. The gradual rise in the standard of living arising out of economic growth in several directions will cause higher consumption of food grains and other agricultural products. Agro-based industries too will make heavy demands on agricultural production. Thus there will be a continuously increasing demand for agricultural products. So long as this growth of demand is there, the requirements of fertilisers will correspondingly grow. And in an ever-growing market, the competent producer will always get attractive reurns. For, fertiliser brings more profit to the farmers.

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PLEA TO END DUAL CONTROL ON FRUIT PRESERVATION INDUSTRY

THE Central Government will explore the possibilities of helping the fruit preservation industry overcome the difficulties caused by the application of the Prevention of Food Adulteration Act in addition to the Fruit Preservation Order.

The Union Food Ministry will hold discussions with other concerned Ministries on the subject, it was said by the Minister of State for Agriculture when a delegation of the U. P. Fruit Products Manufacturers Association met him in New Delhi on July 30.

The association, which had made a representation to the Food and Agriculture Minister on July 11, followed it up by sending the delegation.

UNNECESSARY ACT

The president of the association, Mr. K. P. Bhargava, pointed out to the Minister that the fruit preservaiion industry had invited control over itself through the Fruit Products Order. The Agricultural Marketing Adviser, with zonal offices in various parts of the country, administered the order whose penal clauses included the seizure of goods, destruction of stocks, suspension of production, cancellation of manufacturing licences and also rigorous imprisonment up to three years for an offender. While such a comprehensive order existed, there was no need for the Prevention of Food Adulteration Act which punished the offender but left him free to carry on the trade.

Mr. Kailash Nath of Messrs. Har Narain Gopi Nath, Delhi, stated that nowhere in the world was the fruit preservation industry saddled with dual control as it was done in India.

The P. F. A. Act had a misleading conception of adulteration. He said that, out of thousands of samples collected by the P. F. A. and F. P. O. authorities so far, not one was found adulterated in the true sense. Therefore, the application of the P. F. A. Act to the industry was detrimental to its growth. Mr. Nath further contended that the staff at local laboratories who examined the samples were not properly qualified for testing fruit products. The laboratories were poorly equipped.

Mr. N. A. Pandit of Tata Oil Mills Co., Bombay, who was formerly production manager of Kissan Products Ltd., said that the colours used by the industry were either imported or based on imported material. The suppliers certified that the colours confirmed to P. F. A. Act specifications, but the laboratories in this country were not properly equipped to test them. Mr. Pandit stated that only the Central Food Technological Research Institute in Mysore was competent to test fruit products. He suggested that the Government should test colours when they were imported.

Mr. Y. K. Kapoor of Messrs. Northland Industries said it was strange that fruit products were included in the P. F. A. Act when the F. P. O. existed. Under the F. P. O., only the Agricultural Marketing Adviser was the competent authority to sanction the prosecution of offenders. The intervention of the P. F. A. authorities was undesirable.

FINAL ANALYSIS

Mr. Daya Nand, Senior Marketing Officer, told the delegation that the Agricultural Marketing Adviser had been in correspondence with the Director-General of Health Services and it was agreed that the P. F. A. authorities would not intervene at the factory level and that factories having licences under the F. P. O. would not be required to take licences under the P. F. A. Act.

Mr. Daya Nand said that his department was of the view that the P. F. A. authorities might continue to collect samples, but the non-comforming samples should be sent to the CFTRI for final analysis. The Agricultural Marketing Adviser would sanction prosecution only when the CFTRI report was adverse.

Mr. P. S. Srinivasan, Secretary, Processed Foods Export Promotion Council, informed the delegation that the Union Health Ministry felt that, despite the efficient administration of the F.P.O. by the Agricultural Marketing Adviser, it was not desirable to scrap the P.F.A. Act in view of the strong public sentiment against food adulteration.

On behalf of the delegation, Mr. Bhargava represented to the Minister that the anomalies between the specifications under the F.P.O. and the P.F.A. should be removed; dual control on the industry should be avoided; separate definition of adulteration and sub-standard products should be made; analysing of products should be standardised, and prosecution should be at the place of manufacture.

The other members of the delegation were: Mr. R. K. Puri, Kissan Products Ltd., Bhojeepura; Mr. B. N. Tandon, U. P. Chemicals & Fruit Products Pvt. Ltd., Bareilly; Mr. M. L. Aroura, Aroura Fruit Industry, Lucknow; and Mr. Shanker, Spencers & Co. Ltd., Kanpur.

EQUIPMENT AND METHODS FOR PACKAGING DAIRY PRODUCTS

By CLIFFORD CLOTHIER

Editor of "Packaging" (London).

CONSUMPTION of liquid milk and products derived from milk is at an extremely high level in Britain. Most of the commercial operations are on a large scale, with many others of more moderate size, and this has led to the development of a highly sophisticated dairy engineering industry, while intensive efforts have been made in the rationalisation of milk production and milk distribution.

The dairy engineering concerns offer equipment of modern design and exemplary construction. Britain pioneered the distribution of liquid milk in bottles, a changeover enforced by Government action, so that there was a powerful impetus towards the development of hygienic bottling machinery.

Even before pre-packaging of butter became general practice, machines for wrapping butter in vegetable parchment (Pergamyn) were developed to improve hygiene. The packaging of natural cheese was not mechanised until much later, however, when the success of processed cheese in foil packages prompted cheese-producers to consider the pre-packaging of both kinds as essential for the newer methods of distribution—for example self-service selling.

The result is that Britain's dairy equipment and processing and packaging methods provide for the highest standards of hygiene. Development of the aluminium foil cap for milk bottles, for example, began there—with the consequence that milk-bottling machines built in many other countries incorporate British foil-capping heads (1) as standard.

IMPRESSIVE LIST

The list of manufacturers of dairy equipment in the Food Machinery Association's catalogue (2) is impressive. Every branch of dairying is included, and equipment ranges from small semi-automatic machines used by local dairies to high-capacity installations used by the main dairy group, although its machinery is supplied to many dairies belonging to other organisations.

The economics of milk distribution in Britain necessitate a high standard of efficiency in the equipment used : with liquid milk consumption per head among the world's highest, efficient and reliable machinery is vital. To deliver about one pint (0.568 litre) per head to every household in the country each day a highly organised system of collection and processing, and of bottling and delivery, is obviously essential—and with few exceptions, the dairies use mainly British plant.

As has been implied, liquid milk is normally delivered to each house or apartment every day in Britain, and other dairy products are offered at the same time—cream, butter, cheese, yoghurt (curd) and "speciality" milks, such as fruit-flavoured kinds for children. Many dairy products, including milk in carton-packs, are also sold in self-service stores, leading to the development of pre-packaging for every type of milk product. In this respect also, economic pressures and sales competition have led to a combination of low-cost yet highly effective packaging machinery for butter, cheese, yoghurt and the like.

DEMANDS OF TRADITION

Tradition in Britain demands that butter be wrapper either in vegetable parchment or in paper-backed aluminium foil; there is consequently less emphasis on plastics packages for this product, although one successful marketing scheme uses injection-moulded polystyrene containers, attractively printed in white on a blue ground and with a transparent, snap-on lid, for a special-grade butter. However, machines which can take a roll of thermoplastic film, vacuum-form it to produce individual compartments, fill them with butter (or other product) and finally heatseal covers or lids to complete the packages are now available (4).

Yoghurt is now an important commodity, and British-built machines for filling yoghurt into glass or plastics containers are readily available. For the most part, this product is retailed in injection blow-moulded disposable polystyrene containers, but the same machines will handle glass jars or beakers, which are thereafter lidded with aluminium foil caps.

Large quantities of natural cheese are pre-packed in shops or stores, using simple aids for wrapping portions in shrinkable film, but equipment for shrink-wrapping on a higher scale is also available. Development of the "Flowpak" (5) principle, with provision for extracting air from the pack and substituting an inert gas, provides for the packaging of the varied types of cheese produced in Britain—as wide a variety as can be found anywhere in the world. Latterly, much effort has been directed to the production of the more popular kinds in rectangular shapes, to enable it to be divided into conveniently rectangular portions, rather than into the "wedges" cut from cir-

cular cheeses, but machinery is available for both styles.

ICE-CREAM PACKAGING

Ice-cream is another large-scale outlet for liquid milk, and its packaging requires a high level of hygiene. The changeover to a wrapped product and to packaging in "tubs" (beakers) or waxed-paperboard folding boxes has increased the demand for ice-cream in the home. Machinery developed for this type of packaging offers an efficient means of supplying an expanding market.

With the ever-increasing "internationalisation" of consumption-patterns, there is little doubt that a type of package or a system of distribution which has found favour in one country can expect to find a sure market in others, because it obviously meets a specific need. Thus, the vacuum-pack has quickly developed in many countries, because it conserves the product for longer periods than were possible with earlier methods of packaging.

"New" types of packaging material quickly become available in every country also, no matter where they originated. Machinery which can utilise the traditional materials or can be adapted to use the "new" ones is virtually international in scope.

GROWING USE OF FOIL PACKS

Some of the recent advances in packaging equipment and methods have already been mentioned, but a number of projects are still under development. We may mention the increasing use of aluminium foil containers, for which British-built equipment (6) for their manufacture and for lidding and sealing exists; the advent of the "smooth-wall" type of aluminium foil container greatly increases the attraction of this inexpensive pack for dairy products.

There has also been a considerable development in bulk-packing of milk and other dairy products. For the catering industry, the plastics thin-walled container in a fibreboard outer has proved popular for vinegars and wines, and this trend is now spreading to the milk industry. One British firm enjoys world-wide leadership in the supply of specially designed dispensers and taps for this type of pack, a technical lead which has undoubtedly assisted the growth in the use of these "bag in box" containers. Machines for the production of the plastics inner containers are also available.

In the field of ancillary equipment—such as machines for loading or unloding milk-bottles, using either wood or metal or plastics crates—British machinery-builders have long since established a lead. (These machines can also be used in the brewing industry).

All other types of handling equipment, and ancillary items such as conveyers, are built in Britain and since they are readily adjustable can be adapted without difficulty to metric measurements. The problem of metrication has latterly been reduced by the partial adoption of metric standards of measurement. Now that adoption of the metric system has been declared to be official policy in Britain, firms with overseas markets will force forward this particular change.

Canning of milk and milk products, such as full-cream condensed milk and also milk-powder, has long been used in Britain to provide a milk supply which could be held "in reserve". The coming of "instant mix" milk as an alternative to milk-powder has led to the adoption of the lever-lid reclosable can as a convenient pack for this type of milk. An aluminium foil sachet, for smaller quantities, is also being developed.

"Long-life" or "uperised" milk is now impinging on the sales of milk-powder and condensed milk. At present it is being sold mainly in the original Tetra Pak aseptic package, but machinery is under development for bottling and sealing under aseptic conditions: this equipment will be similar to that already in use for the bottling of cream. When so packed—without additive or preservatives—the milk can be sold and stored without need for refrigeration and will keep in fresh condition for long periods without impairment of flavour or texture.

References to companies mentioned in the article:

(1) Fords (Finsbury) Ltd., Chantry Avenue, Kempston, Bedford, England.

(2) Food Machinery Association, 14 Suffolk Street, London S.W. 1.

(3) U. D. Engineering Company Ltd., Abbey Works, Cumberland Avenue, London N.W. 10.

(4) Brecknell, Dolman ond Rogers Ltd., Pennywell Road, Bristol 5, England.

(5) Baker Perkins (Exports) Ltd., 13 Stanhope Gate, London W. 1.

(6) Star Aluminium Company Ltd., 97 Penn Road, Wolverhampton, Staffordshire, England.

Contributions invited

Articles, preferably illustrated, on topics of interest to the food and allied industries are invited.

Whether it is a controversy to be debated, a problem to be discussed, a grievance to be voiced, an experience to be shared, an event to be recorded or an achievement to be highlighted, The Food Industries Journal provides the best medium of communication.

Contributions should be typed and normally not exceed 1,000 words.

FOOD NEWS

MAHARASHTRA SETS WORLD RECORD IN GROWING GRAPES

MAHARASHTRA has set a world record in grape growing with the production of 22,000 kg. per acre and pushed the United States to the second place.

The achievement is remarkable when one considers that two years ago the production per acre in Maharashtra was only 12,000 kg.

The credit for this performance goes to the Principal of the Krishi Mahavidyalaya at Akola, Dr. N. Gopalakrishna. He devised the "overhead trellis system," which gives more fruiting area to grapes and more exposure to the sun. This is said to be an improvement on the American "Kniffen system" by which grape vines were trained on two wires.

Dr. Gopalakrishna said that, while there were hardly ten acres under grapes in grape-growing Vidarbha, the acreage rose to 2,000 in 1962 and 8,000 this year.

He acknowledged the "inestimable contribution" by the Chief Minister, Mr. V. P. Naik, made to the achievement in grape-growing and the cultivation of hybrid jowar in Maharashtra.

Dr. Gopalakrishna said that grape growers were individually approached in the Vidarbha region and persuaded to increase production through better techniques. The result was a world record in grape production.

WHEAT COMPETITION

In the wheat-growing competition in Gujarat, a farmer of Kubhasan village, in Banaskantha District, Mr. Amichand Hiralal Patel, won the first prize of Rs. 2,000 for producing 3,752.32 kilograms per acre. Mr. Ghemaraj Dolatbhai of Sokalasan village in the same district, won the second prize of Rs. 500 producing 2,610. 90 kilograms.

WOOD FLOUR AS FOOD

Saw dust from certain trees contains minerals and the flour made from it can be used with food, a tapioca specialist, Mr. P. V. Thomas, said in Ernakulam recently. He said that the kelp tree, growing in the sea, contains minerals and kelp pills are being used with food in certain countries.

Mr. Thomas suggested that the dust of such trees should be analysed to find out whether it has nutritive value. The wood flour of the trees can be used as cattle feed.

PEST CONTROL

A panel of experts of the Food and Agricultural Organisation, meeting in Rome in September, underlined the importance of biological and ecological methods of pest control, either by themselves or in conjunction with chemicals.

The experts said that pests could be controlled by introducing among them natural enemies or infertile males so that breeding might be reduced. Early maturing crops could be grown so that they could be harvested before the pests start ruining them.

PESTICIDES PROMOTION BOARD

The setting up of a pesticides promotion board in the public sector has been recommended by the National Council of Applied Economic Research after making an integrated study of the economic and agronomic aspects of pesticides.

The proposed autonomous board should have representatives of agriculturists and the pesticides trade. Its work will be promotional. Private trade will be mainly responsible for the distribution of pesticides, The board would ensure that farmers have adequate credit facilities for buying pesticides.

The NCAER has pointed out that the loss of agricultural produce due to pests affecting standing crops and spoiling stored food grains is 20 per cent.

Based on the experience of farmers, the NCAER estimates that 344,000 tons of technical grade material will be needed in the country against the present licensed capacity of 50,000 tons. The Union Government's estimate of the needed pesticides is 83,000 tons by 1970-71.

DISTILLERY NEAR SHOLAPUR

Farmers producing grapes at Nanaj village, near Sholapur, propose setting up a Rs. 10-lakh distillery on

a co-operative basis. They will collect Rs. 1 lakh as share capital and the Maharashtra Government, which has approved the proposal, is expected to invest an equal amount. Besides, it will also give a loan of Rs. 8 lakhs.

LENTILS FOR CEYLON

The Union Government proposes to supply 7,500 tons of lentils to Ceylon in spite of the ban on their export. Nearly 3,000 tons of lentils has reached that country, it was officially stated.

India banned the export of lentils in January this year.

PINEAPPLE DEVELOPMENT

The Mysore State Co-operative Apex Bank proposes to finance a Rs. 2-crore plan for the development of pineapple in six districts of Mysore State.

The bank will give loans to co-operative societies for the large-scale growing of pineapple.

Chickamagalur, Coorg, Hassan, Shimoga and North and South Kanara districts are considered suitable for growing pineapples.

COCOA CULTIVATION

The Union Government proposes to increase the area under cocoa cultivation from 600 acres to 1,000 acres by 1970. It is considering a proposal to give loans and technical advice to intending growers of cocoa.

Andhra, Kerala, Madras, Maharashtra and Orissa are the States selected for cocoa cultivation besides the Andaman Islands.

Though the import of raw cocoa beans rose from 442 tonnes in 1960-61 to nearly 900 tonnes in 1965-66, the manufacturing industry is said to be experiencing a shortage of raw material. It is estimated that the total need of the manufacturers is 4,000 tonnes, assuming that they work their plants only on a single shift.

At present, India exports 344 tonnes of processed and semi-processed food containing cocoa, valued at Rs. 13 lakhs. The annual export target by 1970 is fixed at 530 tonnes.

FISHERIES MASTER PLAN

A 20-year master plan for the development of fisheries in Kerala, costing Rs. 400 crores, will be prepared by the end of this year by the State Government, the Director of Fisheries, Mr. A. I. George, said in Calicut.

The State Government hopes to receive substantial financial aid from the World Bank and the FAO. A World Bank team will visit Kerala soon.

SOFT DRINKS PLANT IN BAGHDAD

A Bombay firm will participate in a joint venture in Baghdad for the manufacture of soft drink concentrates.

The firm will supply technical know-how, machinery and raw materials.

This is the first joint venture by an Indian firm in Iraq.

LYSINE-BOOSTED FLOUR

The first consignment of 5,500 tons of flour, strengthened with lysine, arrived in Calcutta recently from the Netherlands. Lysine is a synthetic product, developed from coal, which increases the protein value of food grains. It was evolved in the research laboratories of the Dutch State mines.

Experts assert that four pounds of lysine mixed with one ton of wheat will give the maximum yield of protein. The cost of one pound of lysine is about Rs. 10.

Personalia

MAJ. N. V. R. IYENGAR

Maj. N. V. R. Iyengar, Deputy Director (Research and Development) of the Indian Institute of Packaging, has been nominated to a number of committees of the Indian Standards Institute, including the convenorship of AFDC 23.4, Packaging for Storage and Transport of Fruits and Vegetables Sub-committee.

Maj. Iyengar is one of the Honorary Advisers of *The Food Industries Journal,* nominated by the Indian Packaging Institute last month.

MR. A. RAY

Mr. A. Ray, Honorary Director of the Indian Institute of Packaging, has been elected a member of the Institute of Packaging, U. K.

MR. S. K. SOMAIYA RE-ELECTED

Mr. Shantilal K. Somaiya, Director of the Godavari Sugar Mills Ltd., has been re-elected President of the Sugar Technologists' Association of India for another term of one year.

LEVER APPOINTMENT

Dr. Umanath Rege has been appointed Manager of Hindustan Lever's Food Development Unit at Ghaziabad.

Dr. Rege (32) took his doctorate in food technology from Oregon State University (U. S. A.) and was with Vulcan-Laval Ltd., Bombay, before joining Hindustan Lever.

Dr. P. R. Schroeder, whose appointment as Development Manager of Hindustan Lever at Ghaziabad was announced earlier, has not been able to take up the post, it is learnt.

Trends & Topics

GROUNDNUT IS OILSEED, RULES ALLAHABAD HIGH COURT

Groundnut is an oilseed, it has been held by the Allahabad High Court.

The court gave the ruling while dismissing, on August 7, an appeal filed by the Avadh Sugar Mills, Sitapur, against the order of the Sales Tax Officer imposing a purchase tax of Rs. 96,670 on oilseeds bought by it.

The tax was in accordance with the notification of the U.P. Government under the Sales Tax Act which levied a purchase tax on oilseeds.

The Division Bench comprising Mr. Justice Dwivedi and Mr. Justice Gangeshwar Prasad referred to commercial news published in several newspapers and market reports on food grains and oilseeds which had included groundnut among oilseeds.

The judges said that businessmen in the country appeared to consider groundnut an oilseed. "Oil is extracted from groundnut on a commercial scale. If groundnut oil is produced from seed, groundnut will surely be an oilseed."

They, therefore, held that "the appellant has been rightly taxed."

PROBLEM OF MALNUTRITION

Addressing the Indian Council for Child Welfare, Dr. S. Chandrasekhar, Union Minister for Health and Family Planning, revealed that the information collected by the National Nutrition Council confirmed that 80 per cent of India's youth suffered from "malnutrition dwarfism". He pointed out that there was substantial evidence to show that there was a relationship between malnutrition in the early stage of childhood and retarded mental development. In this connection, he hailed the launching of the Protein Foods Association, which has been formed to guide manufacturers and help them produce protein-rich foods at low prices.

Dr. Chandrasekhar urged the National Nutrition Council to prepare a plan of solving the problem of nutrition.

Recently, in a message on the eve of Children's Day, the Union Health Minister rightly highlighted the same problem when he pointed out that the diet of Indian children was grossly deficient in proteins, vitamins and minerals. He appealed to health workers and teachers to address themselves to the task of carrying the message of nutrition to the masses and assured them of all support.

While the Government's drive to combat malnutrition is to be welcomed, it is to be pointed out that their efforts should be supplemented by the work of private agencies, particularly food industries. Influential organisations like the newly-formed Protein Foods Association consisting of leaders in the food manufacturing line can play a very helpful role. The Government, it is hoped, will mobilise the support of the Association and also extend to it all facilities to help it achieve its objective of producing protein-rich foods at prices well within the reach of the masses. Organisations like the Central Food Technological Research Institute and the Nutrition Research Laboratories at Hyderabad, which have done pioneering research in food technology and nutrition, could provide the Association with technical assistance and collaboration.

VEGETABLES & ISI

The Indian Standards Institution has circulated for comments from interested parties draft specifications for certain vegetables and for tolerances for water for the fermentation industry.

The specifications are for turnip, beets, sweet potato, capsicum (green chillies) and fresh banana and for tolerances for water used by the fermentation industry.

The ISI says that, since there is no orderly marketing of fresh fruits and vegetables, there is considerable confusion about their quality. Indian Standard specifications have been drafted to provide an orderly marketing of fruits and vegetables and enable the consumer to identify quality specifications.

Indian Standard specifications for water for the fermentation industry will apply to water used for brewing, boiler feed, bottle and keg washing and pasteurisation, cooling, mash making and deproofing.

COMMITTEE FOR U.K. FOOD INDUSTRY

An economic development committee has been formed in the U.K. for the food manufacturing industry. The Chairman will be Mr. J. R. M. Rocke, Vice-Chairman of Booker Brothers McConne. Until now, the industry has had two Little Neddies, one for food processing, the other for chocolate and sugar manufacture. Both were chaired by Mr. Rocke.

The two have now been combined into the new committee as a matter of logic and convenience, and the body will thus cover all the main sectors of food manufacture; grain milling; bread and flour confectionery, biscuit, bacon curing, meat and fish products; milk products, sugar, cocoa, chocolate and sugar confectionery; fruit and vegetable products; animal and poultry foods; vegetable and animal oils and fats; other food industries and soft drinks. About 670,000 people are employed in the industry.

NEW PRODUCTS, PACKS AND PROMOTIONS

MILKOTINE is the latest product of Foods, Fats & Fertilisers Limited. Launched on the eve of Divali, Milkotine is the second food beverage to be introduced by the company, the other being Ovomalt. Pleasantly flavoured and fortified with vitamins and other energy-giving ingredients, the new milk product is an ideal nutritious drink, especially useful to invalids and nursing mothers, it is said. Milkotine contains barley malt, cream milk, almond, cardamom and pistachio, besides vitamins, Niacin and mineral salts.

BRITANNIA glucose milk biscuits have been protein-enriched. Made with "sun-ripened wheat, sugar, glucose and milk", " only Britannia glucose milk biscuits have the extra proteins for vital energy," the manufacturers claim in their current advertisement campaign in the daily press.

MONITA snack wafer biscuits come in six fruity flavours: orange, lemon, vanilla, strawberry, raspberry and pineapple. In a national promotion campaign, buyers are offered free a copy of "Mary Poppins" colour story book with songs in exchange for 12 wrappers of Monita snack wafer biscuits.

GOLD SPOT bottle tops are in great demand, thanks to a special gift offer by the manufacturers of the popular drink, the Parle Bottling Co. Private Limited. The gifts offered in exchange for Gold Spot bottle tops are a Bush Baron radio for 25,000 tops, an H. M. T. wrist-watch (12,000 tops), a Gold Spot electric clock (8,000 tops), a Wilson 'Goldfinger' ball-point pen (400 tops), a Continental-design Gold Spot drinking glass (80 tops) and an extra-large pencil (30 tops).

DR. WRITER'S squashes and syrups now come in bottles with a new shape which is at once elegant and streamlined.

SWITA is the latest to join the ever-growing list of sweetening tablets. Said to be "just as good as sugar," Swita, it is claimed, has one advantage: "it adds to the taste, without adding to your waist-(line)".

COMPANY NOTES

GANESH FLOUR MILLS CO. TAKES TO CANNED FRUITS MANUFACTURE

THE Ganesh Flour Mills Co. Ltd,. which is well known for its ready-to-serve mutton specialities, has entered the field of fruit preservation. During the year the company started manufacturing fruit juices and canned fruits in its Krip's breakfast foods division.

The Company reported higher sales of Rs. 22.47 crores during the year ended March 31, 1967, against Rs. 17.82 crores in the previous year. The working resulted in a higher gross profit of Rs. 27.87 lakhs (Rs. 15.77 lakhs). After providing Rs. 13.99 lakhs (Rs. 13.35 lakhs) for depreciation, Rs. 62,890 (Rs. 7.10 lakhs) for development rebate reserve and Rs. 3.60 lakhs (nil) for taxation, the net profit works out at Rs. 9.65 lakhs against a net loss of Rs. 5.68 lakhs in the previous year.

The Directors have proposed to pay preference dividends amounting to Rs. 1.81 lakhs, but have decided to pass over the equity dividend. They have instead transferred a sum of Rs. 7.50 lakhs to general reserve.

The company's vanaspati factory at Kanpur fared well during the year because of the timely arrival of cheaper imported oils. Restrictions on the import of oats and other raw materials from one State to another hampered the production and economic working of the company's breakfast food factory. The solvent extract plant in Bombay worked satisfactorily and its output is proposed to be increased.

FOCUS ON RESEARCH

DISEASE-RESISTANT POTATO

A study of hairy sprout, the common potato disease, is being done by the Central Potato Research Institute at Simla. Experts will study the causes of the disease and try to find out varieties of potato which resist it.

The four-year project, to which the United States Government has given a grant of Rs. 1.58 lakhs, is an expansion of a study undertaken by the institute. Dr. Pushkar Nath, director of the institute, will be the leader of the study team.

The grant for the study, given by the Agricultural Research Service of the U. S. Department of Agriculture, comes out of the rupee fund accruing to the U. S. Government in India from the sale of food grains supplied under P. L. 480.

PARASITE TO KILL TUBER MOTH

The potato research centre at Khed, near Poona, is breeding a parasite, brought from the Commonwealth Institute of Biological Control, Bangalore, for eradicating the "tuber moth" virus that sometimes ruins 70 to 80 per cent. of potato production in Maharashtra.

The Potato Development Officer, Maharashtra, Mr. A. B. Joshi, told newsmen that the tuber moth had wrought such havoc that it had sent many potato farming co-operatives to the verge of ruination.

He was confident that the parasite being bred at Khed would wipe out the tuber moth virus in the next 10 or 20 years and prove cheaper than pesticides and insecticides in the long run.

The parasite was being imported at present. Each of its larvae cost about 50 paise.

The parasite and its larvae fed on the larvae of the tuber moth and destroyed its cycle of development, said Mr. Joshi. Four to five thousand larvae of the parasite would be sufficient for one acre of potato crop. Once the larvae of the parasite were tied to potato plants, they, began devouring the tuber moth. Good results had been obtained in Cyprus by the use of the parasite. It could be tried with advantage in this country.

There was some initial investment. However, once the parasite was used, it would save the recurring expenditure needed for pesticides and insecticides and help increase potato production, said Mr. Joshi.

BENEFICENT PARASITES

Two research studies on beneficent parasites are being undertaken by the Indian station of the Commonwealth Institute of Biological Control.
and the tomato fruit worm or the corn ear worm, which are formidable enemies of agriculture in America, will be studied.

A previous project made a study of the natural enemies of these pests. The species of the natural enemies have been sent to the U. S. and the results of trials there are awaited.

A study of the genus of flies called Trichogramma is also being undertaken. This genus is a parasite of the sugar stem borer which destroys sugarcane.

Dr. V. P. Rao, entomologist in charge of the Institute, said that the result of the studies would be of great value to agriculture in this country.

The U. S. Government has given grants amounting to Rs. 5.38 lakhs for the studies. The U. S. Consul in Madras, Dr. Robert W. Caldwell, presented the amount to Dr. Rao.

BOOK & JOURNAL REVIEWS

Fruit and Vegetable Preservation : By B. N. Agnihotri; Krishi Sahitya Prakashan of Narhi, Lucknow; Rs. 1.75.

Written in English, this 75-page booklet deals with all aspects of processing and preservation of fruits and vegetables. Besides explaining in detail modern methods of canning, the handbook provides information on the machinery and equipment needed by food processing industries. Informative chapters on squashes, syrups, preserves, jams, jellies, cheese, chutneys and dehydrated fruits and vegetables make the booklet a helpful guide to those intending to set up small-scale food processing units.

A Hindi edition of the book is also available and plans are under way for Bengali. Gujarati and other language editions.

JOURNAL OF NUTRITION AND DIETETICS

Published by the Sri Avinashilingam Home Science College, Coimbatore, this is a quarterly journal devoted to the publication of original research and review articles in the field of nutrition and dietetics. Leading scientists are associated with the Editorial Advisory Board of the Journal with Dr. Rajammal P. Devadas as Managing Editor.

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Edited, printed and published by Asha Amin. Printed at Perfecta Printing Works, 109-A, Industrial Area, Sion, Bombay-22.
Published from 3-A, New Queen's Road, Bombay-4 BR.